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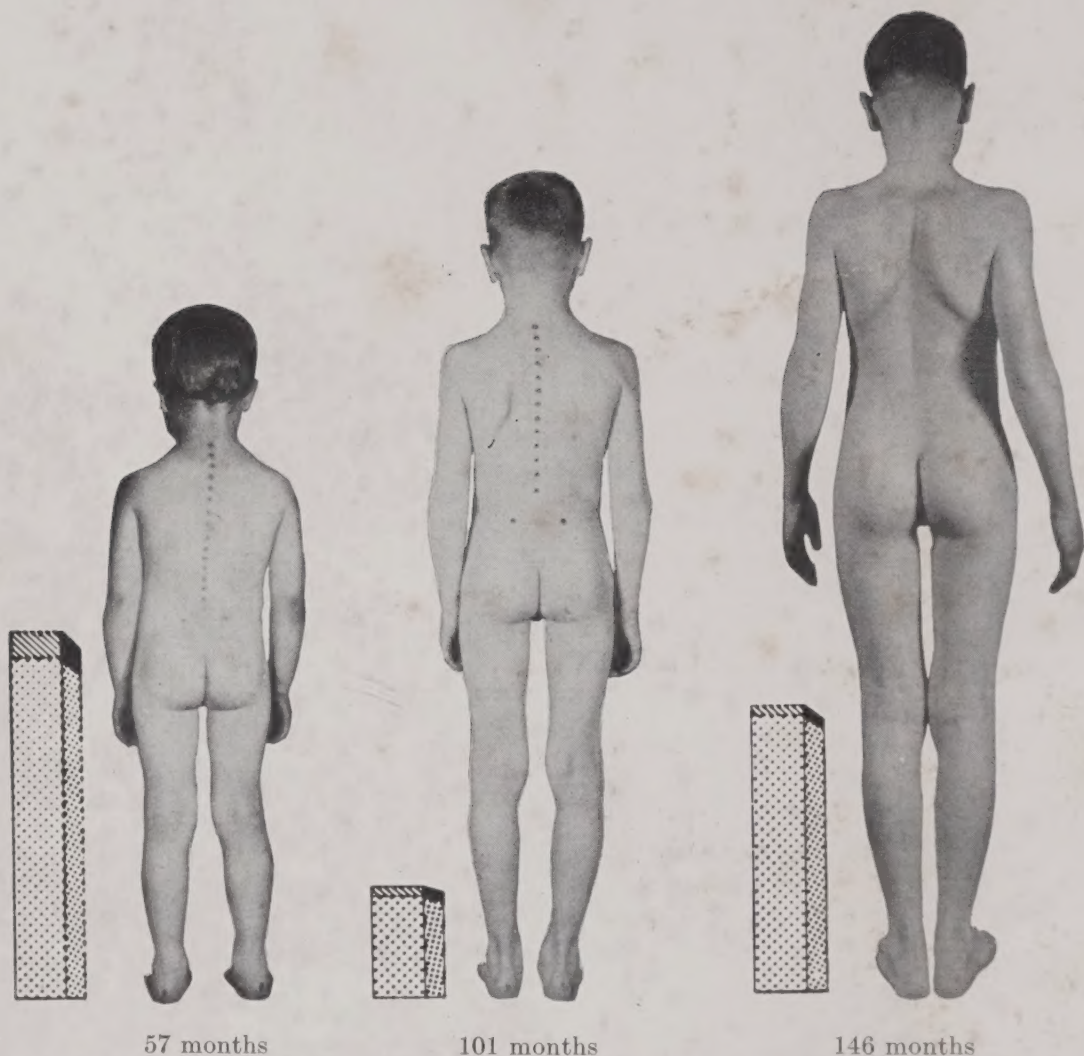
NUTRITION  
AND  
CHEMICAL GROWTH  
IN CHILDHOOD

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VOLUME II  
ORIGINAL DATA

TLM





57 months

101 months

146 months

Relative amounts of hard and soft tissue formation indicated by mineral retentions of one boy during 55 consecutive days at each of three ages.



# NUTRITION AND CHEMICAL GROWTH IN CHILDHOOD

VOLUME II  
ORIGINAL DATA

ICIE G. MACY, PH.D., SC.D.

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With a Foreword by

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*Editor of the American Journal of Roentgenology and Radium Therapy*

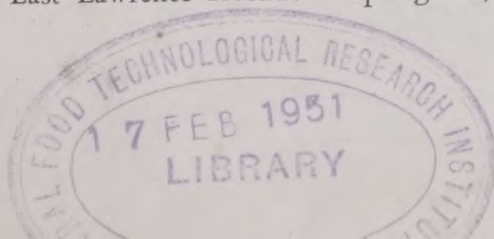
and a Supplement by

JULIA OUTHOUSE HOLMES, PH.D.

*Presenting data collected in the  
Department of Home Economics, Agricultural Experiment Station,  
College of Agriculture, University of Illinois*

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CFTRI-MYSORE



1311

Nutrition and ch..

PRINTED IN THE UNITED STATES OF AMERICA



*Dedicated to*

LAFAYETTE B. MENDEL

WHOSE WRITINGS AND TEACHINGS INSPIRED  
COUNTLESS STUDENTS AND LEFT A PERMANENT  
IMPRINT ON OUR SEARCH FOR KNOWLEDGE

The science of nutrition is in the midst of a  
continual evolution of facts and development of  
truth. For the present, therefore, we should  
"first get the facts."

LAFAYETTE B. MENDEL



THE CHILDREN'S FUND OF MICHIGAN

*Established April 11, 1929, by James Couzens*

"TO PROMOTE THE HEALTH, WELFARE, HAPPINESS AND  
DEVELOPMENT OF THE CHILDREN OF THE STATE OF  
MICHIGAN, PRIMARILY, AND ELSEWHERE IN THE WORLD"

*—From the Trust Instrument by James Couzens*

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## FOREWORD

Men are but children of larger growth

*Dryden*

IN THE Foreword to Volume I on *Nutrition and Chemical Growth in Childhood*, Dr. Freund expressed the thought that the work of Dr. Icie Macy Hoobler and her collaborators established a mosaic for those who would visualize early chemical changes dealing with growth and development, and Volume II extends this mosaic into a more complete pattern.

Far, far too long has the subject of growth and development occupied a place of "scientific obscurity"; only within recent years has this been approached from a thoroughgoing intelligent and scientific aspect. No longer can so important a subject as growth and development be ignored; it occupies too important a place in the ultimate body economy.

Until quite recently most of our knowledge of growth and development was obtained from animal experimentation and it is not always easy to transfer knowledge obtained from such experiments into human equivalents. Dr. Macy Hoobler and her associates, in their first volume added enormously to our knowledge of growth and development in the human being. In their investigation they sought to obtain the greatest possible amount of accurate information about this subject. While some isolated reports of many of the separate phases of the investigations of growth and development had been published, it was not until the appearance of their studies in collected form that any comprehensive coordinated studies on nutrition and chemical growth in childhood were available.

Through fortuitous circumstances and cooperative efforts they were able to investigate the many body processes of a group of children of different ages over a long period of time and to present in detail some of the physiological occurrences at various age levels in the lives of normal children.

It was their intent in Volume II to make a detailed interpretation of these various studies. However, as their work progressed on this second volume it was apparent that a single additional volume could not include all of the data and a full interpretation of the original results. Therefore, they resolved to publish in this

second volume *all the facts* which they had observed in this extensive study over a period of years. The publication of these facts in their entirety it was thought would be helpful to worker in various fields of nutrition and chemical growth in childhood. They have emphasized the fact that these studies were not projected with the sole thought of determining food requirements, although during the course of the investigation valuable information was obtained on this subject. It is particularly appropriate that this information be made available to a world which at this time finds itself at the end of a prolonged and devastating war not only depleted in its moral status but hopelessly deficient in adequate nutritional requirements, and any modicum of knowledge which might be useful in such a catastrophe is doubly welcome.

The recent statement by the National Draft Board that 30 per cent of all those examined for the draft were rejected for physical defects, and that the percentage of rejection was lower in the younger age groups and higher in the higher age groups, reaching as high as 49 per cent for registrants between the ages of thirty-four and thirty-seven, is a sad commentary on our boasted wealth and industry. Any information which would lead to a correction in future years of so glaring a defect is welcome. While our knowledge of the whole complex phenomenon of growth and development is woefully deficient, this timely publication of Dr. Macy Hoobler and her co-workers adds greatly to our knowledge and has given us a mighty push along the road from the unknown to the known. Fortunately, her work has not been hampered by lack of funds and she had been ably assisted by the intelligent, cooperative support of a band of loyal workers. The compilation of this imposing amount of material does not have that imperfection which is so often found in works which have had many collaborators. Aristotle says that "he who sees things grow from the beginning will have the finest view of them." While Dr. Macy Hoobler and her collaborators have not had this all important opportunity, they have taken a segment of childhood during its active growth and development and have analyzed its every feature, making use of all of the available means, namely clinical, anthropometric, chemical, spectrographic and roentgenologic, and since climate itself plays such an important part in growth and development, that, too, has been taken into account in the interpretation of results.



These important investigations and their publication have been made possible through the munificent and unparalleled gift of the late Senator James Couzens and the wise guidance of the splendid Board of Directors which was chosen to administer the Fund. We await with considerable interest the publication of the subsequent Volume III—*Interpretation*.

LAWRENCE REYNOLDS

Detroit, Michigan





## PREFACE

THE purpose of these studies was to obtain the greatest possible amount of accurate information about the *growth and development* of a few normal children, under conditions comparable with those of a healthy home environment. Isolated investigations of many of the separate phases of the studies have been more extensive than ours, but, until now, no comprehensive, co-ordinated investigation of nutrition and chemical growth in childhood had been published. Through cooperative effort, involving a majority of the sciences dedicated to promoting healthy and happy living, we have been enabled to present data which permit study of the results of many body processes of a group of representative children of different ages and of some of the children at different stages of growth and development.

In assembling Volume I of *Nutrition and Chemical Growth in Childhood* we were faced with the necessity of presenting in detail the exact conditions under which the studies were conducted and the methods by which observations were made, samples obtained and analyzed, and data calculated. With these descriptions we were able to include average values demonstrating some of the physiological occurrences at various age levels in the lives of normal children. In the *Preface* to Volume I we stated "Volume II, *Interpretation*, will consider the nutrition and growth of individual children and will emphasize the synergic and cumulative aspects of nutriment assimilation and the chemical composition of growth." Also, we called attention to the lack of comprehensive studies in this field and to the incongruity of the conditions under which the values reported in the literature have been obtained.

As work proceeded on the second volume it became apparent that a single tome could not include all of the data and a full interpretation of the original results. In the course of the studies over 6000 five-day balances were determined, approximately 18,000 analytical values for intake, urine and feces. In addition, thousands of other data represent the coordinate phases of the investigation. The calculated data necessary for a comprehensive interpretation of the results outnumber the "original data" several times.

We have been acutely aware of the possibility that new discoveries, new techniques, and new methods of analysis, may in time permit additional interpretation of the data. For many years we have recognized the broad range included in "normal variation" between individuals and in the same individual at different times. Frequently, the condensation of data required for publication of experimental results has withheld all opportunity to study these changes which portray the internal dynamics of the body as the entire structure progresses through a more regular course in time. Also, the nutritional catastrophe with which man has confronted his own civilization has created an immediate, urgent need for every bit of information which might contribute to the recovery of vigor and physical fitness by the people of many nations. For these reasons we have compiled the original values obtained during the studies and present them, alone, within these covers. In Volume I, *Evaluation*, average values were given for copper, manganese, nickel and zinc in intake, urine and feces, as determined by the polarographic methods given in that volume. The polarographic results have been tabulated in this compilation but in addition, all of the samples available now have been analyzed by spectrographic methods.

As the materials for this volume assumed final form, Julia Outhouse Holmes, Ph.D., was invited to include the original balance data obtained under her direction in the Department of Home Economics, University of Illinois. Dr. Holmes and I worked together at the University of California. She was my first assistant and coworker in establishing the Laboratory and its program, when it was a part of the Merrill-Palmer School and the Children's Hospital of Michigan. At that time we were greatly encouraged by the interest shown in our work and the courtesies extended to us by the staff of that Hospital, especially Dr. B. Raymond Hoobler, at that time Medical Director, and Miss Margaret A. Rogers, Superintendent. Through the interest of physicians representative of many of the local medical groups, we were privileged to attend their discussion groups and meetings and "make rounds" with them, gaining an understanding of medical and hospital practices which has been of lasting value to us.

The experiences and associations of that period stimulated our interest in child health and development and we planned



studies which would start at the beginning—with the human mother during pregnancy and lactation—and which we hoped would contribute to better understanding of the processes of normal growth and development and the influence of disease. Out of this planning grew the studies of *Nutrition and Chemical Growth in Childhood* and, at the University of Illinois, Dr. Holmes conducted studies of the nitrogen, calcium and phosphorus metabolism of preschool boys and girls. The data have been included as a separate section of this volume and greatly enhance its value as a reference, since the children studied were much younger than those who cooperated with the Research Laboratory.

In addition to the studies of the metabolism of normal children we have had opportunities to study the utilization of food substances under several abnormal conditions. The results of investigation of a case of osteopsathyrosis and one of ununited fracture stressed the need for values obtained with normal children. When a case of ideopathic lipemia was admitted to the Children's Hospital of Michigan, mineral balances were obtained with the child on both low- and high-fat diets. Two years following the hospital studies the same child was studied simultaneously with the group of normal children who participated in the third study of nutrition and chemical growth in childhood. Partial reports of the results of these investigations have been published, but because the data illustrate the essentiality of standard values in estimating deviation from the normal, and demonstrate the practical application of the procedure with medical patients, we have given them in detail in the Addenda to this volume.

Concurrent with the studies of mineral metabolism in childhood our research staff has conducted extensive studies of the blood in health and disease. The subjects of the investigations of nutrition and chemical growth were the "normal controls" for studies of the blood during anemia, hemophilia and thrombopenic purpura. "Sick controls," children who were hospital patients because of ailments which presumably would not influence the blood picture, also were included in the studies. These data were published in several papers, but because they contribute some additional information about the group of normal children and provide a comparison between "normal" and "sick" control subjects, they also have been included in the Addenda.

In preparing the copy—it can hardly be called manuscript—for this book we have avoided any discussion of the significance of the various results. Our prime endeavors have been for accuracy and completeness. We have spent many years in intensive labor to *get the facts*. Thus, we have included *all the facts*, though some will be helpful to only a small fraction of the workers interested in nutrition and chemical growth in childhood. However, portions of the data will be useful to workers in various specialized branches of science. In addition, educators may find illustrative material for classroom teaching and data suitable for thesis projects when complete laboratory facilities are not available. In striving for accuracy, completeness and usability, niceties of style and appearance have frequently been sacrificed. Except for the few exceptions in which enhanced usefulness outweighed all other considerations we have omitted calculated values, with the conviction that other students will find the original data in their entirety more valuable than any derived values which might have been included by sacrificing completeness. Volume III of this series will contain the interpretation based upon our calculations with the data.

In addition to their intrinsic value the data in this volume provide conclusive evidence of the necessity of maintaining broad concepts of human growth and development in any consideration of corrective or preventive nutritional procedures, indicating the wide range of response which must be accepted as “normal.” The scope of the observations and determinations emphasizes the possibilities inherent in close cooperation and collaboration between members of many branches of the medical profession, research workers and agencies whose primary function is social service. Many research projects would be facilitated by the cooperation of such organizations as The Methodist Children’s Village, where our studies were conducted, and the Cunningham Home, where the University of Illinois studies were carried on, and many such organizations, no doubt, would be as eager as these two were to participate in a major contribution to science.

---

The data from the spectrographic analyses for iron, manganese, copper, aluminum, lead and tin in food and feces were obtained by James K. Brody, M.S., of the Research Laboratory staff.



Additional assessments of skeletal maturation according to the Todd technique were made by S. Idell Pyle, M.S., Research Associate, Department of Anatomy, Western Reserve University, Cleveland.

The endocrinological examinations reported in this volume were made by Robert L. Schaeffer, M.D., W. L. Brosius, M.D., and E. A. Sharp, M.D., Detroit.

The roentgenograms of the children's jaws were procured in connection with an orthodontia study by Samuel Lewis, D.D.S., and Douglas J. Jamieson, D.D.S. We are indebted to Haven F. Doan, D.D.S., for assistance in arranging and checking the films before publication.

The estimations of saliva culture activity were made by Marshall L. Snyder, Ph.D., Hygienic Laboratory, University of Michigan.

Critical reproduction of roentgenograms is always difficult. The films shown in this volume were obtained over a period of fourteen years and the minimal losses in detail between the original and the printed engravings are attributable largely to the efforts of Frank N. Russlander, medical photographer, Harper Hospital, Detroit, who made the actual size photographs which were used by the engraver.

ICIE MACY HOOBLER

Detroit, Michigan





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## INTRODUCTION

**I**N VOLUME I of this series the children who took part in more than one investigation were considered as different individuals in each study and data were presented as averages for the various age groups. Of the 21 boys and girls, one (Donald) participated in all three studies and six others (Billy, Herbert, Frank, Bobby, Barbara, Jimmy) cooperated in the second and third investigations. In Volume II all of the data for each child have been kept together but are separated with respect to the different studies by designation of the child's age at the start of the investigation. Different metabolic balance periods are distinguished by the month and date of the first days of the periods. With observations obtained at intervals during several years, both ages and dates are given.

Any expectation that 10 healthy children and four adults could live together and carry on the rigid experimental regime of these studies for as long as eight months without some physical and emotional disturbances would be overoptimistic. Such disturbances were kept at a minimum, however, by the efforts of a staff of calm and efficient supervisors and by the fortuitous environmental circumstances which permitted the use of a cottage at the Methodist Children's Village (p. 45). Occasionally, one of the children acquired a slight cold or had some other minor disturbance. These have been noted in connection with the medical histories of the children. There were a few emotional upsets arising from conflicting personalities and competition among the children. These were easily controlled by the staff but they have been referred to in some of the sections which present the psychological characteristics of the children.

Of the data obtained from over 600 five-day balance period studies, values from few periods were discarded owing to illness. Where such values are missing from the tables, footnote references have been included. In rare instances minor disturbances were portrayed in the analytical values for a balance period, although they had not interrupted the collection of samples. These values were omitted from the averages given in Volume I but are shown in the tables of this volume in italic type and addi-

tional information is included in the case histories of the children.

Occasionally, a value for a specific determination is missing from one of the tables. Two factors have been responsible for this small number of missing values: (1) accidents in which samples were lost through breakage, during collection of excreta by the children; (2) lack of sufficient sample material for all of the determinations. When a value for food, urine or feces was missing from a balance the corresponding values were not considered in compiling the averages given in Volume I, i.e., if a value for urine was missing, the food and feces values for that period were excluded from the averages. All balance data omitted in averaging are shown in italics.

In addition to the data procured during the balance studies,

TABLE 123

## ANALYSES OF INDIVIDUAL FOODS

*Values per hundred grams of edible portion*

FOOD	Number of samples	LIGNIN			CELLULOSE		
		Mean	Min.	Max.	Mean	Min.	Max.
		mg.	mg.	mg.	mg.	mg.	mg.
Apple, not peeled	2	170	136	203	514	460	568
Banana, peeled	3	416	344	462	153	60	234
Beef	2						
Bread, white	3	71	68	76	92	0	275
Bread, whole wheat	3	451	290	592	627	470	740
Butter	3						
Cabbage	3	87	60	104	531	504	552
Carrot	3	97	64	114	676	608	784
Cheese (Velveta)	4						
Corn flakes	3	184	117	223	599	453	757
Egg	2						
Gelatin	2						
Graham cracker	3	299	178	433	460	264	567
Honey	3						
Lettuce	3	83	80	84	367	340	412
Milk, fluid	5						
Milk, evaporated	2						
Orange juice, fresh	2						
Peanut butter	3	95	36	212	323	100	600
Peas	3	65	48	84	2049	1856	2340
Potatoes, peeled	9	31	7	72	246	0	417
Spinach, canned	1	128	128	128	286	286	286
Tomato juice, canned	2	8	7	10	126	110	143
Shredded wheat	1	797	797	797	1650	1650	1650

\* 1 sample  
† 2 samples  
‡ 3 samples

£ 7 samples  
# 20 samples  
+ 5 samples



other measurements, medical examinations, clinical and laboratory determinations were carried out in the intervening years and in the years after Study III was completed. These supplementary observations were contingent upon the accessibility of the subjects and the facilities available. All available information which might contribute to a proper evaluation of the children's personalities, mental abilities and physical characteristics has been included in the recapitulations for the children.

Since many attempts have been made to correlate various processes of human beings with weather conditions, the official weather reports for the Detroit area were obtained for the months during which the three studies were conducted. These reports are summarized in Table 126.

TABLE 123

## ANALYSES OF INDIVIDUAL FOODS

*Values per hundred grams of edible portion*

[illegible]

TABLE 124

ANALYSES OF INDIVIDUAL FOODS

Values per hundred grams of edible portion

FOOD	Number of samples	NITROGEN			FAT		
		Mean	Min.	Max.	Mean	Min.	Max.
		gm.	gm.	gm.	gm.	gm.	gm.
Apple, not peeled	5	.040*	.040	.040	0.88†	0.30	1.45
Banana, peeled	14	.126£	.100	.165	0.24‡	0.13	0.39
Beef	2	3.141*	3.141	3.141	8.06	1.18	14.93
Bread, white	2	1.560*	1.560	1.560	1.36	1.34	1.38
Bread, whole wheat	2	1.677	1.580	1.774	1.51‡	0.98	2.50
Cabbage	1	.212	.212	.212	.12	.12	.12
Carrot	1	.100	.100	.100	.16†	.12	.20
Cheese (Velveta)	2	3.050	2.950	3.155	19.90	18.50	21.30
Corn flakes	2	1.140*	1.140	1.140	.25	.20	.30
Egg	2	1.698*	1.698	1.698	7.32	7.28	7.36
Gelatin	1	16.200	16.200	16.200			
Graham cracker	2	1.125	1.011	1.239	4.34	3.86	4.83
Honey	1						
Lettuce	1	.136	.136	.136			
Milk, fluid	25	.500	.468	.535	3.45§	3.23	3.60
Milk, evaporated	5	.970†	.960	.980			
Orange juice, fresh	1	.150†	.133	.166			
Orange juice, canned	2						
Peanut butter	2	4.638	4.525	4.750	45.20	44.10	46.20
Peas	2	1.096	1.064	1.124	.44‡	.32	.56
Potatoes, peeled	8	.348†	.328	.368	.10°	.07	1.53
Spinach, canned	3	.289*	.289	.289			
Tomato juice, canned	1	.133	.133	.133			

FOOD	Number of samples	MAGNESIUM			POTASSIUM		
		Mean	Min.	Max.	Mean	Min.	Max.
		mg.	mg.	mg.	mg.	mg.	mg.
Apple, not peeled	5	8	6	8	125	106	149
Banana, peeled	14	33	26	41	387	330	427
Beef	2	13	8	18	290*	290	290
Bread, white	2	28	28	28	107	104	110
Bread, whole wheat	2	67	64	70	203	190	216
Cabbage	1	12	12	12	160	160	160
Carrot	1	18	18	18	320	320	320
Cheese, (Velveta)	2	15	5	25	255*	255	255
Corn flakes	2	37	27	47	98	93	103
Egg	2	2	0	4	120	104	136
Gelatin	1						
Graham cracker	2	62	61	64	384	350	419
Honey	1						
Lettuce	1	12	12	12	172	172	172
Milk, fluid	25	11	8	13	148¶	136	161
Milk, evaporated	5	25	23	27	294	288	300
Orange juice, fresh	1	11	11	11	187	187	187
Orange juice, canned	2	12	9	14	192	132	253
Peanut butter	2	178	175	181	694	688	700
Peas	2	32	32	32	296	196	396
Potatoes, peeled	8	22	18	30	394	303	520
Spinach, canned	3	63	57	68	208	129	286
Tomato juice, canned	1	10	10	10	225	225	225

\* 1 sample  
† 2 samples  
‡ 3 samples

§ 11 samples  
|| 24 samples  
° 6 samples

¶ 27 samples  
£ 7 samples  
§ 13 samples



ANALYSES OF INDIVIDUAL FOODS  
*Values per hundred grams of edible portion*

ENERGY			CALCIUM			PHOSPHORUS		
Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.
Cal.	Cal.	Cal.	mg.	mg.	mg.	mg.	mg.	mg.
55*	55	55	6	5	6	13	9	18
86†	84	88	5	4	8	28	15	34
184	100	267	10	7	14	148	134	162
290	278	302	60	60	60	114	104	124
283‡	256	308	64	62	66	217	204	230
24	24	24	44	44	44	16	16	16
43†	40	46	26	26	26	30	30	30
350	335	365	565	530	600	875	810	940
384	380	387	7	7	7	42	30	53
146	140	152	42	39	44	165	162	169
467	467	467						
372	336	408	46	42	50	157	150	164
293	293	293						
24	24	24	16	16	16	20	20	20
70§	67	74	118¶	107	123	90	84	97
			253	252	256	209	192	214
40	40	40	11	11	11	15	15	15
			12	8	15	24	18	29
632	625	638	28	25	31	341	338	344
96‡	80	108	22	20	24	114	108	120
76	65	100	8	3	13	60	50	75
			53	48	58	344	289	404
20	20	20	3	3	3	17	17	17

SODIUM			CHLORINE			SULFUR		
Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.
mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
2	1	4	2	0	5	4	4	5
5	2	11	110§	36	262	8	7	9
70	50	90	63	51	75	162	150	173
601	558	644	843	804	882	116	112	120
601	588	614	857‡	792	900	126‡	118	136
24	24	24				64	64	64
58	58	58	144	144	144	17†	16	18
1440	1290	1580	1122	995	1250	178	170	185
1120	1100	1130	1633*	1633	1633	115	110	120
128	92	163	124*	124	124	155	127	183
						467	467	467
670	594	747	516	489	544	116	103	128
						13	13	13
16	16	16				12	12	12
50¶	44	61	108¶	92	141	30¶	24	36
138	130	147	224	202	271	68	62	72
6	6	6	8	8	8			
4	4	5	6*	6	6	6*	6	6
384	356	412	616	594	638	225	225	225
98	96	100	187‡	104	336	41‡	36	44
			34	18	63	41	32	50
378	373	386	460†	446	473			
255	255	255	387	387	387	13	13	13

TABLE 125

## VITAMIN C CONTENT OF FOODS

Foods and Conditions of Analysis	Samples	Vitamin C (mg./100 gm.)		
	number	min.	max.	mean
FRUIT AND VEGETABLE JUICE				
Orange Juice, fresh, extracted with glass utensils, strained through cheesecloth....	12	47.2	65.5	55.7
Orange Juice, fresh, refrigerated.....	5	33.2	45.4	40.6
Orange Concentrate, "Sunfilled," diluted 1 to 7, 1 hour in ice box after dilution...	1			39.0
Orange Concentrate (method of preparation not known), undiluted.....	21	9.9	31.6	22.5
Tomato Juice, canned, $\frac{1}{2}$ hour after opening.....	1			15.0
Tomato Juice, canned, a few hours after opening.....	2	13.6	14.9	14.2
Tomato Juice, home canned, open kettle method, immediately after opening.....	2	5.3	5.5	5.4
Tomato Juice, home canned, 27 hours after opening.....	1			3.5
Lemon Juice, fresh, extracted with glass utensils, strained through cheesecloth....	13	37.1	58.6	46.9
Lemon Juice, fresh, after two days in covered dish in ice box.....	1			26.0
FRUITS				
Apples, cooked (1 hr.) to applesauce and in ice box overnight.....	1			0.8
Applesauce, canned, $\frac{1}{2}$ hour after opening.....	1			0.5
Orange Sections fresh, 1 sample stood $\frac{1}{2}$ hour.....	2	33.5	36.0	34.8
Tangerine Sections, fresh, $\frac{1}{2}$ hour after peeling.....	1			37.2
Strawberries, canned, "Del Monte," 1 hour after opening.....	1			31.3
Strawberries, canned, "Bonnylass," 1 hour after opening.....	1			13.6
Strawberries, canned, "Bonnylass," 2 hours after opening.....	2	15.0	28.5	21.8
Raspberries, canned, "Premier," 1 hour after opening.....	2	4.9	6.0	5.4
Prunes, dried, stewed.....	3	1.5	2.4	2.1
Royal Anne Cherries, canned, "Signet," $1\frac{1}{2}$ hours after opening.....	1			4.7
Tokay Grapes, seeded.....	1			2.9
*Fruit Salad (canned pineapple, 47 gm.; raw apple, 6 gm.; Royal Anne Cherries, 11 gm.; banana, 4 gm.; fresh orange, 16 gm.; canned peach, 9 gm.; mixed juice, 7 gm.)	1			9.0
Fruit in jello (peaches, canned, stood 1 day, 35 gm.; raspberries, canned, stood 1 day, 20 gm.; strawberries, canned, stood 2 days, 15 gm.)	1			6.7
VEGETABLES				
*Potato, baked.....	1			5.3
Potato, baked.....	3	7.4	15.0	11.1
Potato, peeled, boiled, immediately after cooking.....	1			11.7
*Potato, boiled in jackets.....	1			12.7
*Potato, peeled, boiled.....	1			4.7
Potato, mashed, 100 gm. mashed = 80 gm. potato + milk, $\frac{1}{2}$ hour after preparation..	1			0.05
Potato, mashed, 100 gm. mashed = 77 gm. potato + milk, $\frac{1}{2}$ hour after preparation..	1			6.6
Potato, mashed, 100 gm. mashed = 60 gm. potato + milk, $\frac{1}{2}$ hour after preparation..	1			4.2
*Potato, mashed, stood 1 hour on steam bath.....	2	1.3	3.1	2.2
*Potato, "Duchess" (browned leftover mashed).....	1			0.2
*Peas, canned.....	2	2.6	7.8	5.2
*Green beans, fresh, cooked.....	1			2.7
Beets, canned, "Premier," $\frac{1}{2}$ hour after preparing.....	3	2.3	5.0	3.9
*Buttered corn, canned, cream style, stood 1 hour on steam table.....	1			2.9
Tomatoes, home canned (cold pack) unheated.....	3	14.7	15.2	14.9
Tomatoes, home canned (cold pack) heated in open kettle.....	1			14.9
Tomatoes, home canned (cold pack) heated in covered aluminum pan.....	1			18.2
Tomatoes, canned, freshly opened, "Hambrooks C," reheated 10 min., 20 min. after opening.....	1			11.0
Tomatoes, fresh hot house.....	1			12.2
Relish Plate (25 gm. celery; 10 gm. radish; 20 gm. lettuce; 15 gm. olive).....	1			5.3
Relish Plate (15 gm. lettuce; 25 gm. celery; 15 gm. pickle; 15 gm. olive; 3 gm. pimento)	1			2.9
Relish Plate (25 gm. celery; 20 gm. lettuce; 15 gm. sweet pickle; 15 gm. olive; 3 gm. pimento).....	1			2.6
Radish.....	1			5.1
SOUPS AND SAUCES				
Tomato sauce, unknown brand from open bottle in hospital ice box.....	1			13.0
Ketchup, unknown brand from open bottle in hospital ice box.....	3	12.3	17.4	14.1
Cream Pea Soup (Gerber's strained peas + milk + cream) $\frac{1}{2}$ hour after preparation.....	2	0.7	0.9	0.8
Cream Spinach Soup (fresh boiled spinach, sieved, + milk + cream) $\frac{1}{2}$ hour after preparation.....	2	2.8	8.0	5.4
Cream Asparagus Soup (Gerber's strained + milk + cream) $\frac{1}{2}$ hour after preparation.....	1			1.2
Cream Tomato Soup (tomato juice + milk + cream) $\frac{1}{2}$ hour after preparation.....	4	1.7	4.6	3.3
MEAT				
Steak, fried.....	1			0.0
*Chicken, roast white meat, heated in skillet with a little water.....	1			1.0
*Roast beef.....	1			0.0
Calves liver, fried.....	1			36.6
MILK				
Raw, refrigerated 16 hours after collection.....	1			1.9
Raw, refrigerated 40 hours after collection.....	1			1.7
Raw, refrigerated 16 hours, then pasteurized in glass vessel, 30 min. at 62° C., refrigerated 24 hours.....	1			1.4
Pasteurized, commercial 2 days after pasteurization.....	2	0.1	0.17	0.14
Evaporated milk diluted 1:1.....	3	0.9	1.1	1.0
Dried skim milk (Klim) diluted as recommended.....	1			1.1

\* Prepared in hospital kitchen and sampled at time of serving.

## WEATHER DATA FOR TIME OF STUDIES\*

Month	TEMPERATURE (°F.)							AVERAGE RELATIVE HUMIDITY (per cent)		
	AVERAGES OF DAILY			FOR MONTH		DAILY RANGE				
	Means	Maxi- mums	Mini- mums	Maxi- mums	Mini- mums	Greatest	Least	8 A.M.	Noon	8 P.M.

DURING THE MONTHS IN WHICH STUDY I WAS CONDUCTED; STARTING MARCH 24

March	29.8	36.2	23.4	58	5	21	3	81	80	75
April	44.3	53.3	35.3	73	25	27	4	74	71	62
May	59.6	69.5	49.8	88	36	32	8	75	68	65
June	70.3	79.5	61.1	89	46	26	13	71	64	58

DURING THE MONTHS IN WHICH STUDY II WAS CONDUCTED; STARTING SEPT. 30

October	51.4	61.6	41.1	80	28	32	11	80	53	66
November	39.9	45.5	34.3	62	19	27	1	84	76	80
December	25.0	29.6	20.3	48	5	18	2	88	80	84
January	21.6	27.6	15.7	46	-6	24	3	86	77	74
February	16.0	25.0	7.1	50	-9	39	9	85	73	80
March	37.6	45.4	29.7	67	10	28	6	79	62	70
April	42.3	49.8	34.8	74	21	34	7	76	59	69
May	62.8	74.4	51.2	90	37	38	14	67	44	52

DURING THE MONTHS IN WHICH STUDY III WAS CONDUCTED; STARTING SEPT. 18

September	65.9	77.3	54.5	100	39	35	12	83†	52‡	63§
October	52.9	62.8	43.0	89	29	29	8	82†	55‡	64§
November	38.9	46.8	31.0	65	21	25	6	83†	61‡	72§

Month	PRECIPITATION (INCHES)				DAYS WITH					TOTAL SUN- SHINE (hours)
	Total	Total non- melting snowfall	Days with more than		Frost	Hail	Sleet	Dense fog	Thun- der storms	
			0.01	0.25						

DURING THE MONTHS IN WHICH STUDY I WAS CONDUCTED; STARTING MARCH 24

March	2.15	11.7	14	3	0	0	1	0	2	124.9
April	2.08	2.1	9	3	4	0	0	0	0	234.9
May	5.42	0	12	5	2	0	0	0	9	277.1
June	1.35	0	6	3	0	0	0	0	4	289.1

DURING THE MONTHS IN WHICH STUDY II WAS CONDUCTED; STARTING SEPT. 30

October	1.24	trace	10	2	0	1	2	4	1	194.8
November	3.43	0.2	14	5	0	0	0	0	0	60.5
December	1.66	8.9	16	3	0	0	1	3	0	57.8
January	1.48	10.1	16	1	0	0	3	1	0	53.2
February	2.62	14.7	15	4	0	0	1	3	0	142.5
March	1.28	1.7	10	2	0	0	0	0	1	203.7
April	3.61	1.2	18	2	3	0	1	1	2	178.9
May	0.97	0.0	7	1	1	1	0	1	4	324.9

DURING THE MONTHS IN WHICH STUDY III WAS CONDUCTED; STARTING SEPT. 18

September	2.70	0.0	10	3	0	1	0	0	5	249.9
October	1.66	trace	14	3	2	0	0	0	2	181.9
November	0.57	trace	6	0	0	0	1	1	0	134.9

\* Compiled from the Monthly Meteorological Summaries published by the U. S. Department of Agriculture Weather Bureau, Detroit, Michigan.

† 7:30 A.M.

‡ 1:30 P.M.

§ 7:30 P.M.



In presenting this compilation it has been necessary to group all of the information upon each child in a separate section. The disadvantages of the procedure to the person interested in a specific value for all the children are obvious. To simplify the task of the research worker or student who wishes to extract comparative data from this collection, Volume II has been made contiguous with Volume I. The numbers designating pages (both Roman and Arabic), illustrations and tables are in continuous series throughout the two books. Likewise, in the index to this second volume, both volumes are covered.

During the course of Study II an opportunity arose to investigate the metabolic responses of the children to endocrine hormone supplements indicated by the "endocrine type" classifications of the children. The children were classified by an endocrinologist by means of physical examination records, personal physical examination, basal metabolism records, and the osseous development shown by the roentgenograms of various bone joints. Appropriate amounts of the endocrine preparation indicated by the child's "endocrine type" were given each child during four 5-day balance periods which were preceded and followed by three balance periods in which no changes in diet were made. The amounts of the preparations given are listed in footnotes to the tables showing food intakes.

## DONALD

Donald's father was American-born of Irish-German parents. His early life was somewhat stormy but he completed the eighth grade at 16 years of age. The father's medical record was essentially negative. The paternal grandfather died of typhoid fever when 23 years old, the grandmother died of cancer of the stomach when 39 years old.

Donald's mother was of Irish extraction. Her mother and father died of apoplexy and heart failure, respectively. The records show no evidence of epilepsy or insanity in the family. She was married in 1923 and the first child, a son, was born in 1924. In the interval before Donald's birth, in 1927, a girl was born who, after six weeks, died of gastritis. Shortly after Donald was born the parents separated, the mother retaining control of the two boys.

### Medical History

Donald was born in a hospital, July 10, 1927. The mother labored for less than 11 hours and was given some ether 20 minutes before the spontaneous delivery. The infant weighed 8 pounds and after a marked loss during the first 24 hours, gained steadily. After two months in the hospital Donald was placed in a boarding home. At that time he weighed 12 pounds, 6 ounces. Two of Donald's teeth erupted before his sixth month, at 8 $\frac{1}{2}$  months he had six, and at 10 months, eight. He did not sit alone until his ninth month, walked at 19 months and his toilet habits were not established until he was 28 months old.

Donald was almost a year and one-half old when first examined by the Children's Village pediatrician. At that time he weighed 24.5 pounds, dentition was in progress and the medical examination was favorable throughout. His nutritional state and general condition were described as "good" throughout the frequent medical examinations during the following three years. Negative Wassermann, Schick, Pirquet and Dick tests were obtained and tetanus antitoxin was given. Except for measles at one year and slight colds, infrequently, Donald's medical history at the time he was chosen for the first study showed a record of continuous health and growth within the normal variations for age.

## Psychological

Donald was first given psychological tests when he was 14 months old. Both 9- and 12-months' level series were given.

He has made very little progress, continues dull, phlegmatic, and presents the appearance of a much younger baby, in spite of his size and physical development. He has gained so little that the findings are now suggestive of delayed mental development and he should not be considered for adoption.

During his first two years Donald was prone to whine, be impatient and cry easily. He developed the habit of holding his breath when angry and upon one occasion was reported to have been unconscious for nearly five minutes. At 30 months he talked more freely and was becoming more friendly, demanding petting and loving, and the breath-holding became less frequent.

A different examiner gave Donald the Kuhlman-Stanford tests when the child was 44 months old:

Child is classifiable as on the border-line between dull normal and inferior intelligence, his test score being M.A. 2 yrs., 10 months, I.Q., 77. On Gesell normative items Donald rates approximately average on the three-year-old level, succeeding in 20 of the 32 items given. The four-year-old level was distinctly too difficult for him.

Donald was 54 months old when he was removed from the boarding home and placed at the Children's Village. At the Village he began to wet the bed and would not go to sleep nights. Two months later he joined the group of children who participated in the first metabolic study and seemed to improve with the increased attention which he received.

At 56 months of age, when Donald joined the first study group, he was a handsome child with light brown hair and hazel eyes. Lefthandedness was noted on the pediatric examination record, together with flat feet and some pronation for which he was wearing Thomas heels ( $\frac{1}{4}$  inch raise). The examiner noted that Donald's general appearance was "robust," with "good" nutrition, development and general oral condition. Subsequent medical examinations at approximately semiannual intervals during the next three years were entirely negative and contained notations of "excellent gain in weight and height—general condition good."

In the almost four years which elapsed between the first and second studies Donald changed greatly in appearance and build.



His health continued to be excellent during the 225 days of the second observation except for five days in November (11-22 through 11-26) during which he had a sore throat of "moderate severity" with evening temperatures as high as 101.6° F. However, the regular daily food intake was maintained and the excreta collected. Donald's medical record has continued to show normal, or better, growth and good nutrition up to the present time, without illnesses of sufficient importance to be noted by the examining physician.

Throughout the years Donald cooperated in the studies he was an attractive youngster, liked by both adults and playmates but emotionally insecure and consequently rather unstable. Attempts to establish a "mother identification" with different housemothers at the Village were unsuccessful during his early years and psychological testing was of little value, owing to his refusal to cooperate. When Donald started to school his difficulties were aggravated by inability to compete with other children his age in the class, although he was larger.

During the second experimental study Donald was eight years old and another attempt was made to obtain accurate psychological evaluation. After completing the Arthur Point Scale the examiner began the Stanford-Binet tests. Donald was so threatened by the test situation that after several attempts the psychologist discontinued the tests rather than disturb him further while getting results which would be unreliable. The only responses obtained on the Binet Scale were to three tests at the Year VII level, which were all successful. On the Arthur Point Scale Donald's rating was at the high-range average level (M.A. 8 yr. 11 mo.; I.Q. 106). The examiner stated:

The quality of his work was reasonably consistent. At times he was slow in his work and unable to make decisions. Sometimes he is very impulsive in his reactions while at other times he is more deliberate. Donald's rating on this performance test was definitely better than his rating on previous tests given; most of the previous tests were Stanford-Binets. It seems evident that his response to any test situation has been affected by a great deal of fear and threats to his security and self-confidence.

Three years later Donald was re-examined by the same psychologist and given the Revised Stanford-Binet (Form D) test. He was rated at the borderline level (M.A. 8 yr. 2 mo.; I.Q. 73).

His basal age was Year VI and successes ranged through Year XI. He was very poor in auditory rote memory tests, for digits, sentences and paragraphs. His ability is much better, however, in

tests of visual memory since his memory for designs was successful at the Year XI level. He was erratic in his response to tests in which he was to generalize or make comparisons, since he failed a test of this type at Year VIII but passed one at Year XI.

Donald has very poor ability to concentrate or sustain his attention. His replies are always brief. How much he is aware of his own limitations is not clear. It is certain, however, that he is very much threatened by problems that are difficult for him.

In understanding Donald's difficulty in adjustment, his limited ability in dealing with abstract verbal problems must be compared to his high range average ability in dealing with concrete problems as shown by his response to the Arthur Point Scale three years ago, on which his I.Q. was 106. While this difference in ability is not too uncommon, it provides an additional problem to which he must adjust. One of the chief implications for prognosis is that his general school work will be slow but he does have good ability along more practical lines and would undoubtedly profit by special training in shop work. It is probably true, also, that his fears prevent him from working up to capacity in both the area of abstract verbal reasoning and concrete problems.

During Study III, Donald, who had joined the group voluntarily, continued to be dissatisfied, morose and show hostility to every phase of his situation. The child guidance worker who visited the children several times each week during the study reported: "He appears to put on an air of bravado and is opposed to any undertaking in the cottage. He puts on hostile feelings when he can play to an audience and shows little enthusiasm or animation."

Donald was given several "appointments" with the worker during the course of the study. The interviews were arranged in the "playroom" of the Village and Donald seemed to enjoy them. Upon one occasion he chose to play checkers and won three of five games. He was most skillful in planning moves. After winning two of three racing games he lost interest, however. When opposed in any way Donald sulked. When one of the children in the cottage had a birthday party Donald became so annoying that the housemother was forced to have him leave the table. It seemed that Donald could not stand having someone else get attention.

Following the third study a further attempt was made to get an adequate psychological estimation of Donald. The examiner reported:

He doesn't seem to want people to be nice to him; he doesn't seem to have any idea of his relationships with people and the pleasantness that comes from personal social relationships. It was the examiner's impression that there is no way of appealing to him



except to delete the personal element from any of his relationships. It doesn't seem to matter what anyone says in the way of approval; he always says what he has done is no good.

Results: Revised Stanford-Binet, Form L	M.A. 10/2, I.Q. 84
Arthur Point Scale	M.A. 12/10, I.Q. 103
Ferguson Formboards	M.A. 14/2
Healy P. C. II	Median for age 12
Scaled Information Test	Grade 4, age 9
Gray's Oral Reading Paragraph	No Score

Summary: Donald is an attractive 12-year-old boy, who, however, has a personality which is almost completely negative. He does not show interest in anything; he seems to assume an attitude toward all the materials of "I don't know, I don't care," and "I can't try." He has little interest and seems to be quite resistant to any adequate personal social relationships. He has somewhat low average ability in handling abstract materials, average ability in concrete situations, probably more than average ability if he were adequately tested in concrete situations. He showed good ability to use cues in a concrete social situation. He does not read and he has a very narrow background of facts and information.

It is the examiner's feeling that Donald is very resentful in all personal social relationships, that he blocks off in self-defense when he is forced to do things for which he has not learned the fundamentals. He is a very upset boy and although these tests show him to be low average, the examiner does not feel that they are in any way reliable due to the resistance during both periods of the examination. It is the examiner's recommendation that he should not be retested until he has thoroughly worked through his emotional problems since he is getting a great deal of reaction against having to repeat these tests which he has done many times before, and it would seem best to discontinue any testing program until his emotional problems are much more relieved than they are at the present time.

Donald's emotional problems did not interfere with the studies—not did the studies accentuate his difficulty in adjustment. In fact, Donald shared in the prestige of the children who were chosen for the experimental work and since the studies imposed equal restrictions upon the entire group of youngsters he was not threatened by any feeling of inferiority in connection with the routine. Actually, participation in the investigations benefited Donald physically, and if the regularity and security of the experimental regime did not help him emotionally, at least his problems were not aggravated. One of the by-product results of the studies was the recognition of Donald's problems and the attempt to help him become better adjusted for the future. These efforts have been partially successful.



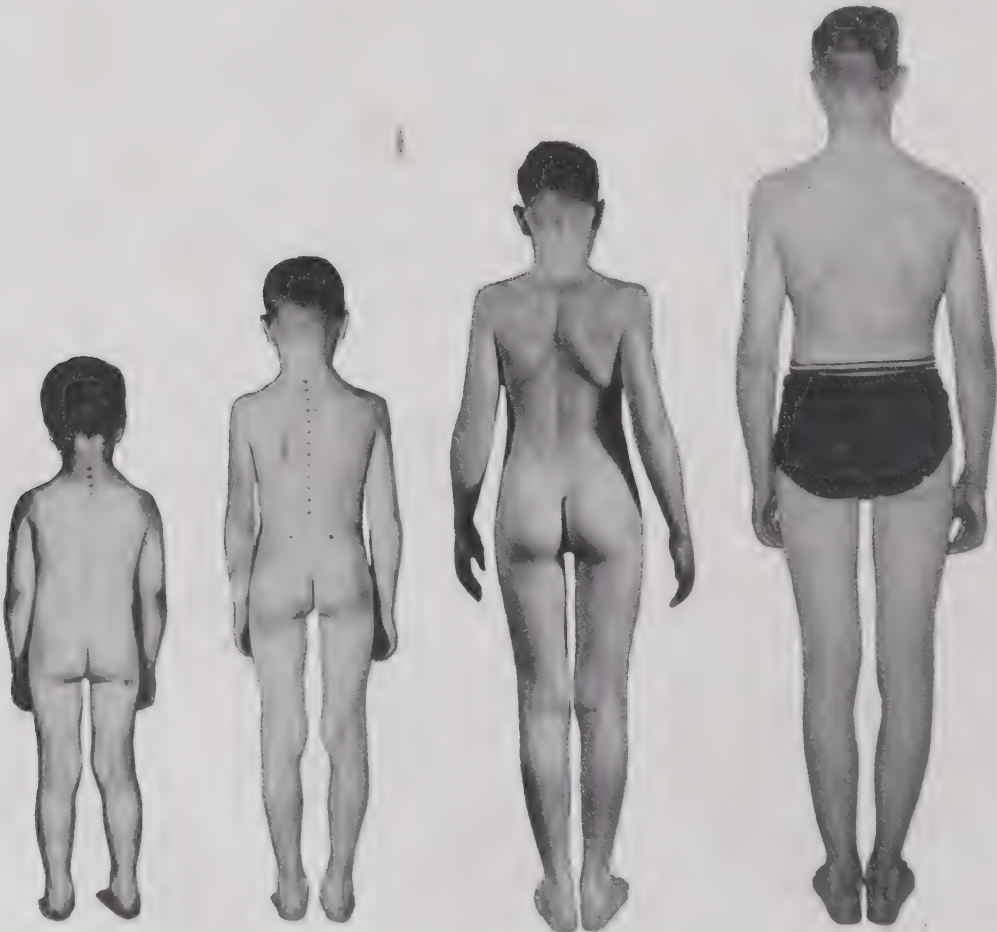
Donald

TABLE 127

HEIGHT AND WEIGHT RECORD\*

Age	Height	Weight	Age	Height	Weight	Age	Height	Weight
months	inches	pounds	months	inches	pounds	months	inches	pounds
54	42	41	95	52 $\frac{1}{4}$	65	134	59	87
57	42	42	97	52 $\frac{7}{8}$	66	136	59 $\frac{1}{2}$	96
60	43 $\frac{1}{2}$	46	101	53	64	140	60 $\frac{1}{2}$	94 $\frac{1}{2}$
64	44 $\frac{1}{2}$	48 $\frac{1}{2}$	106	54	67	143	60 $\frac{3}{4}$	96 $\frac{1}{2}$
68	45	50 $\frac{1}{2}$	108	54 $\frac{1}{4}$	71 $\frac{1}{4}$	149	62 $\frac{1}{4}$	100 $\frac{3}{4}$
72	47 $\frac{1}{4}$	52				153	63	105
76	48 $\frac{1}{4}$	55	111	54 $\frac{3}{4}$	70	157	63 $\frac{1}{2}$	112 $\frac{1}{4}$
79	49 $\frac{1}{2}$	56 $\frac{1}{4}$	118	56 $\frac{1}{2}$	78 $\frac{1}{2}$	159	64	122 $\frac{1}{4}$
83	49 $\frac{1}{2}$	55 $\frac{3}{4}$	124	57	84 $\frac{1}{4}$	165	65 $\frac{1}{4}$	132
89	51	61	130	58	83 $\frac{1}{4}$	176	68 $\frac{1}{4}$	136 $\frac{1}{2}$
94	51 $\frac{3}{4}$	64 $\frac{1}{2}$	131	58 $\frac{3}{4}$	82 $\frac{3}{4}$	189	72	145

\* Clinical. See also table of recumbent lengths and weights.



57 months                      99 months                      146 months                      183 months

FIGURE 67. DONALD

TABLE 128

Donald

## SKELETAL MATURATION

*Values in months*

Chrono- logical age	HAND				FOOT	ELBOW	KNEE	HIP	SHOULDER	AVERAGE
	B.B.G.*	Flory†	Kelly‡	Todd§	Todd§	Todd§	Todd§	Todd§	Todd§	Todd§
47	57	36	<72	51	—	51	—	—	—	51
58	71	41	<72	69	—	63	—	—	—	66
68	82	55	74	81	—	77	—	—	—	79
95	111	92	116	121	113	120	122	123	122	120
98	118	100	121	122	114	122	125	124	124	122
104	120	99	124	127	121	125	127	128	128	126
106	120	102	134	129	123	127	129	129	131	128
120	146	108	136	134	139	139	132	130	135	135
146	202	139	176	153	153	159	159	159	153	156
183	>204	148	>216	186	—	—	—	—	—	—

\* Baldwin, B. T., Busby, L. M., Garside, H. V. Anatomic growth in children. University of Iowa Studies in Child Welfare, vol. 4, no. 1, 1928. (No standards over 204 months.)

† Flory, C. D. Osseous development in the hand as an index of skeletal development. Monographs of the Society for Research in Child Development, vol. 1, no. 3, 1936.

‡ Kelly, H. J. Anatomic age and its relation to stature. University of Iowa Studies in Child Welfare, vol. 12, no. 5, 1937. (No standards less than 72 months.)

§ Determined by method of Todd. Assessments made by T. Wingate Todd, C. C. Francis, and S. Idell Pyle, Western Reserve University, Cleveland.

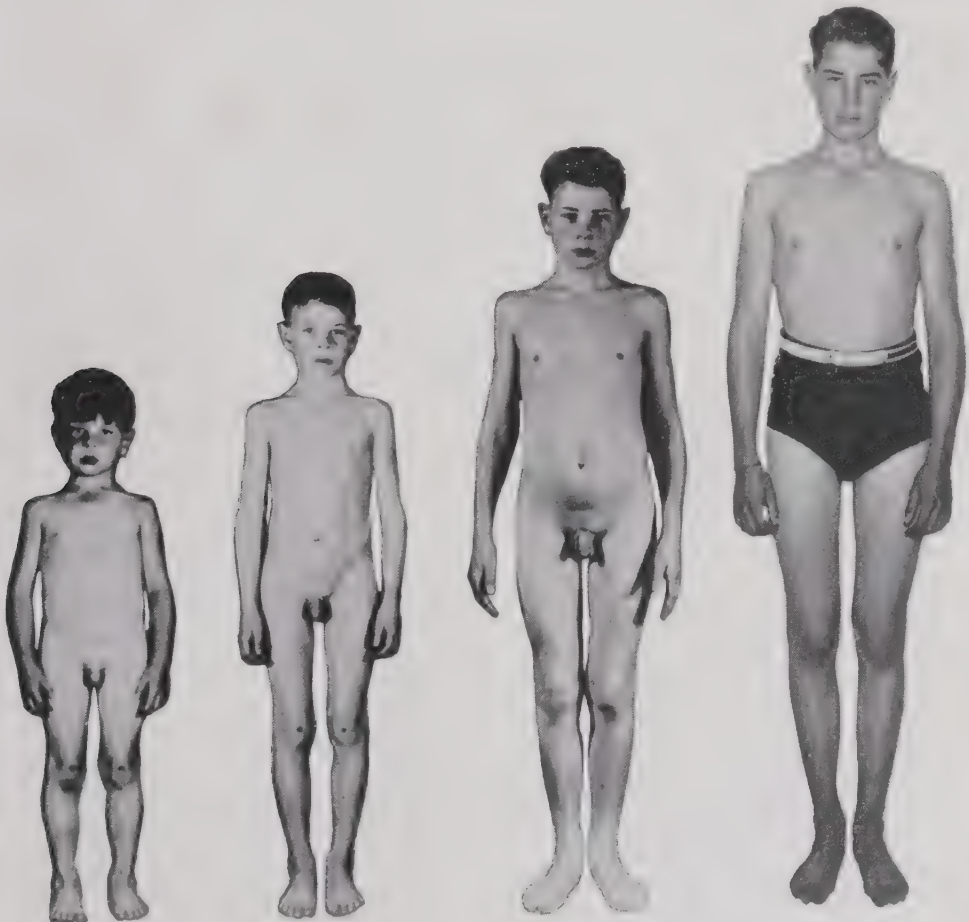


FIGURE 68. DONALD

57 months

99 months

146 months

183 months

TABLE 129

Donald

## ANTHROPOMETRIC MEASUREMENTS

*Values in centimeters*

Age*	BREADTH			LENGTH		WIDTH	
	Biacro- mial	Intertro- chanteric	Inter- cristal	Tibia	Head	Chest	Head
100	23.4	24.3	22.5	29.7	19.6	20.0	14.1
101	25.0	23.7	20.8	30.3	19.3	20.4	14.2
102	24.5	24.2	20.6	29.1	19.0	20.2	14.2
103	24.9	24.0	20.5	30.4	19.2	20.4	14.1
104	24.5	24.4	20.8	30.0	19.0	20.1	14.1
105	25.2	24.0	21.1	30.1	19.2	20.9	14.2
106	25.2	24.6	21.3	31.0	19.1	20.3	14.2
107	25.0	24.9	21.5	31.0	19.0	20.0	14.2
108	25.7	24.5	21.4	31.5	19.3	21.0	14.3
110	24.6	24.5	21.2	31.8	19.1	20.8	14.2
111	25.4	25.5	21.4	31.7	19.3	20.2	14.2
112	25.4	25.0	23.2	32.0	19.2	20.3	14.1
113	26.5	25.5	21.3	32.3	19.2	20.2	14.2
117	26.0	25.8	22.6	32.4	19.2	21.7	14.2
120	26.0	26.7	22.8	34.0	19.4	21.6	14.2
135	26.7	—	23.5	34.8	19.4	23.2	14.5
146	27.7	—	23.6	37.1	19.4	24.0	14.5
147	28.5	—	23.6	36.5	19.0	22.7	14.5
148	28.0	—	23.5	36.9	19.5	23.0	14.5
183	39.1	34.1	28.5	51.6	19.5	27.7	14.9

Age*	DEPTH	CIRCUMFERENCES				
	Chest	Head	Chest	Thigh	Abdomen	Upper arm
100	15.0	53.0	60	33	55	16.6
101	14.6	53.5	62	33	54	17.5
102	15.5	53.0	60	32	54	17.0
103	14.8	52.8	59	33	55	17.2
104	14.5	53.4	64	34	55	18.0
105	15.0	52.7	60	34	56	17.6
106	14.5	53.3	60	35	55	17.5
107	15.5	53.2	65	36	59	17.5
108	15.8	54.0	63	36	60	18.8
110	15.4	53.5	64	36	58	18.0
111	14.5	53.2	63	36	57	18.0
112	15.5	53.0	64	36	59	18.2
113	15.0	53.4	64	37	58	18.5
117	15.5	53.0	66	38	60	19.0
120	15.3	53.5	68	38	62	19.8
135	17.5	54.0	69	40	66	20.2
146	17.2	54.0	70	41	63	21.0
147	16.0	54.0	70	41	60	20.5
148	16.5	54.4	70	42	61	21.0
183	19.2	55.3	84	51	80	26.2

\* Months.



TABLE 130

Donald

## FOOD INTAKE DURING STUDIES

*Values in grams per day*

Food	Basal diet during 13 five-day periods from 4-23 to 6-27 Initial age, 57 months	Basal diet during 45 five-day periods from 9-30 to 5-12 Initial age, 99 months	Basal diet during 11 five-day periods from 9-18 to 11-12 Initial age, 146 months
Apple	100	100	100
Banana	100	—	150
Lean beef	60	100	100
White bread	60	70	50
Whole wheat bread	30	30	50
Celery	20	—	—
American cheese	15	15	20
Honey	—	—	15
Whole egg	50	50	100
Lettuce	20	20	25
Milk	400*	—	500†
Orange	100 (whole)	—	100(juice)
Potato	70	70	120
Shredded wheat	30	15	—
Tomato juice	60 (whole)	60	60
Butter	30	—	60
Peas	—	—	25
Salt	2	2	2
Gelatin	—	—	3
Cabbage	25	25	25
Carrot	25	25	50
Peanut butter	—	16	16
Graham cracker	—	18	36
Corn flakes	—	15	30
Sugar (average)	77	—	22
Water (average)	548	—	557

FOODS GIVEN IN ADDITION TO BASAL DIET  
DURING STUDY AT AGE 99 MONTHS

	DATE							
	9-30 to 11-4	11-4 to 12-4	12-4 to 1-13	1-13 to 2-7	2-7 to 3-3	3-3 to 3-18	3-18 to 3-23	3-23 to 5-12‡
Milk	400*	400*	800‡	800§	800§	800§	800§	800§
Orange concentrate	50	50	50	50	50	—	—	—
Fresh orange juice	—	—	—	—	—	50	50	50
Banana	100	200	100	100	100	100	100	100
Spinach (canned)	—	—	—	—	100	100	—	—
Butter	30	30	40	40	40	40	43	43
Water (averages)	421	387	473	556	536	377	460	500
Sugar (averages)	11	8	8	9	10	13	13	12

\* Plain fluid milk.

† Irradiated fluid milk.

‡ Plain fluid milk, 400 gm.; evaporated milk diluted 1:1, 400 gm.

§ Irradiated fluid milk, 400 gm.; irradiated evaporated milk diluted 1:1, 400 gm.

¶ Oxalic acid 0.7 gm., and calcium (as acetate), 0.058 gm., additional.

¶ Antuitrin G, 5 cc., hypodermically, April 7, 9, 12, 14, 17, 19, 22, 24.

## BLOOD DETERMINATIONS

Age	Date	Red cells	Hemo-globin	WHITE BLOOD CELLS				
				Total	Poly-morpho-nuclears	Lympho-cytes	Mono-cytes	Eosino-philés
months	mo.-day	millions	gm./100 cc.	per c. mm.	per cent	per cent	per cent	per cent
60	6-28	3.80	13*	7200	54	44	2	0
95	6-20	5.29	12†	6500	58	32	7	3
98	9-11	4.4	12	5700	64	30	6	0
98†	9-11	4.40	12†	—	—	—	—	—
104	3-14	4.20	12†	5900	57	32	7	4
106	5-13	4.54	12†	8600	60	28	4	8
106†	5-13	4.38	12†	—	—	—	—	—
120	7-9	5.28	11†	4600	41	47	9	2
146†	9-14	4.61	13§	6400	78	20	—	2

		Hemato-crit	RED BLOOD CELL MEASUREMENTS			
			Volume	Weight	Diameter	Thickness
			per cent	c.μ	μg.	μ
98	9-11	37	84	91	7.2	2.1
106	5-13	35	81	88	7.2	2.0
146	9-14	38	83	—	7.4	1.9

MINERALS (mg. per 100 ml.)								
SERUM					ERYTHROCYTES			
Cal-cium	Phos-phorus	So-dium	Potas-sium	Chlor-ine	So-dium	Potas-sium	Chlor-ine	
58	5-19	9.2	6.00	—	—	—	—	—
98	9-11	10.3	4.85	335	13.6	380	49	392
106	5-13	10.4	7.55	321	16.8	359	—	—
146	9-14	11.9	6.86	320	16.6	368	24	430

PLASMA NITROGEN AND LIPID (mg. per 100 ml.)								
Nitrogen	Total lipid	Phospho-lipid	Neutral fat	CHOLESTEROL				
				Total	Free	Esters		
98	9-11	1140	—	—	—	—	—	—
106	5-13	1150	401	144	35	144	31	191

ERYTHROCYTE NITROGEN AND LIPID (mg. per 100 gm.)								
106	5-13	4656	394	239	24	112	82	49

98	9-11	Resistance to hypotonic NaCl Hemolysis						
		Resistance to saponin Hemolysis						
		Beginning, per cent NaCl 0.40						
		Complete, per cent NaCl 0.32						
		Beginning, μg. of saponin 9						
		Complete, μg. of saponin 50						

\* Newcomer method.

† Venous blood.

‡ Haden-Hausser hemoglobinometer.

§ Evelyn photoelectric colorimeter.

## RECUMBENT LENGTH AND WEIGHT

Age	RECUMBENT LENGTH		Weight	Age	RECUMBENT LENGTH		Weight
	Total	Stem			Total	Stem	
mo.-days	cm.	cm.	kg.	mo.-days	cm.	cm.	kg.
57-3	—	—	19.19	103-9	—	—	28.30
57-8	—	—	19.11	103-12	—	—	28.40
57-13	—	—	19.43	103-18	—	—	28.55
57-20	108.1	—	—	103-22	—	—	28.40
57-24	—	—	20.16	103-26	—	—	28.55
57-28	—	—	20.04	104-2	—	—	28.65
58-3	—	—	20.24	104-5	138.7	73.7	—
58-8	—	—	20.16	104-7	—	—	28.57
58-13	—	—	20.02	104-12	—	—	28.65
58-17	109.4	—	—	104-16	139.4	74.0	—
58-18	—	—	20.03	104-17	—	—	28.10
58-24	—	—	20.19	104-23	139.4	74.3	28.70
58-28	—	—	20.30	104-28	139.1	73.7	28.72
59-3	—	—	20.35	105-3	—	—	28.65
59-9	—	—	20.33	105-4	139.1	73.6	—
59-13	—	—	20.24	105-7	—	—	28.80
59-20	110.6	—	—	105-10	139.1	73.7	—
59-21	—	—	20.34	105-12	—	—	28.77
95-10	132.1	—	28.35	105-17	139.1	73.7	—
98-2	134.6	—	28.69	105-19	—	—	29.34
98-24	—	—	27.81	105-22	—	—	29.35
99-0	—	—	27.76	105-23	138.7	73.7	—
99-8	—	—	27.81	105-27	—	—	29.30
99-12	—	—	27.47	105-28	138.4	73.6	—
99-18	—	—	27.65	106-2	139.1	73.7	—
99-24	—	—	27.37	106-3	—	—	29.10
99-26	136.5	72.4	—	107-4	—	73.4	30.99
99-27	—	—	27.65	108-6	138.9	73.4	32.27
100-4	—	—	27.69	110-6	139.6	74.2	31.14
100-8	—	—	27.40	111-7	140.0	73.7	31.69
100-10	137.2	73.3	—	112-11	140.9	75.2	31.51
100-13	—	—	27.66	113-9	141.8	74.0	32.53
100-19	—	—	27.52	116-21	143.5	76.5	34.05
100-24	—	—	27.61	119-29	146.1	76.7	35.27
100-27	137.8	73.4	—	134-19	149.9	79.3	39.92
100-29	—	—	28.07	146-8	—	—	41.76
101-4	—	—	28.00	146-13	—	—	41.28
101-5	137.8	73.4	—	146-20	—	—	41.66
101-9	—	—	28.09	146-24	159.1	82.2	41.71
101-14	—	—	27.81	146-27	159.0	82.4	—
101-17	—	—	27.80	146-29	158.8	82.2	41.73
101-22	138.4	73.6	27.47	147-1	159.5	82.4	—
101-27	—	—	27.65	147-3	159.4	82.3	41.77
102-4	—	—	27.67	147-8	—	—	41.85
102-5	138.7	73.7	—	147-14	—	—	42.24
102-6	—	—	27.80	147-18	—	—	42.05
102-13	—	—	28.00	147-23	—	—	42.02
102-19	—	—	27.70	147-29	159.3	82.6	42.20
102-20	138.3	73.3	—	148-0	159.4	82.9	—
102-21	—	—	27.90	148-1	159.3	82.1	—
102-27	—	—	27.95	148-3	159.1	82.0	—
103-3	—	—	28.10	148-4	160.1	82.9	—
103-4	138.9	73.7	—	148-5	—	—	42.37
				183-7	180.6	94.4	65.66

Actual values are averages of independent measurements by two workers. In calculating the smooth values given with the balance data the actual values given above were smoothed by three-point averaging and the resulting figures entered for their respective balance periods. Values for balance periods intervening between measurements were obtained by interpolation.



TABLE 133

Donald

## BASAL METABOLISM MEASUREMENTS

Age	Date	Sur- face area*	Respi- ration	Pulse rate	Body temper- ature	Blood pressure	Basal metab- olism
months	mo.-day	sq.m.	per min.	per min.	°F	S/D†	Cal./24 hr.
99	10-2	1.04	25	—	—	—	1171
99	10-17	1.04	20	—	—	—	1123
100	11-5	1.04	26	76	99.4	80/50	1097
100	11-19	1.04	16	76	98.2	76/58	1082
101	12-6	1.05	25	74	98.8	80/56	1039
101	12-14	1.05	21	73	98.4	84/61	1138
102	12-31	1.05	24	74	98.6	84/56	1078
102	1-13	1.05	21	76	98.6	83/58	1109
103	1-28	1.05	22	70	98.8	84/58	1075
103	2-11	1.06	21	70	99.0	84/58	1094
103	2-22	1.06	21	74	98.2	86/58	1073
104	3-13	1.07	25	76	98.2	88/64	1150
105	3-31	1.07	23	68	98.4	82/58	1092
105	4-5	1.07	21	72	98.4	84/56	1066
105	4-11	1.07	22	70	98.2	80/60	989
105	4-17	1.07	24	72	98.7	86/60	1080
105	4-24	1.08	21	72	98.0	84/58	994
106	4-30	1.08	22	76	97.8	86/62	982
106	5-5	1.08	27	73	98.6	90/62	1027
106	5-9	1.08	24	78	98.3	82/60	1094
146	9-21	1.37	24	66	98.0	84/50	1302
146	9-22	1.37	20	62	98.2	82/50	1517
148	10-31	1.39	24	68	98.4	82/50	1418
148	11-1	1.39	20	76	98.6	80/56	1508

\* DuBois formula.

† Systolic/Diastolic.

TABLE 134

Donald

58 months

## ORAL EXAMINATION

The worker who accompanied this child reports he has a speech difficulty. On oral examination, the fraenum holding the tongue to the floor of the mouth was seen to be well-forward and well developed. Perhaps this would give a tongue-tie to which the speech difficulty could be attributed. This youngster also had a geographical tongue.

Oral condition was good and the gums were healthy. There was a medium diastema between both upper and lower deciduous central incisors. Bite is edge to edge. Attrition is medium on both upper and lower canines and anteriors, slight on upper and lower posteriors. Occlusion is normal. There are a few small open cavities in the deciduous teeth. General oral condition is good.

(Upon re-examination one and one-half months later the lower right deciduous central incisor had exfoliated but the permanent central incisor had not erupted. General oral condition was good.)

TABLE 135

Donald

## MEASUREMENTS OF THE BONES OF THE WRIST

AGE, months	47	58	68	95	98	104	106	120	146	183
CARPALS										
AREA, sq. mm.										
Hamate	64	84	102	144	153	160	172	183	228	285
Capitate	93	126	162	238	262	263	262	300	380	454
Lesser Multangular			15	66	74	78	80	104	159	183
Greater Multangular				72	75	80	87	101	158	239
Navicular				51	60	68	70	100	196	305
Lunate		12	27	72	78	85	86	104	152	224
Triangular	27	42	54	85	90	96	96	113	146	179
Pisiform								21	46	107
GREATEST DIAMETER, mm.										
Hamate	10	12	13	17	17	17	17	19	20	24
Capitate	13	15	17	22	22	22	23	24	27	32
Lesser Multangular			4	11	11	11	12	13	15	22
Greater Multangular				11	11	11	13	13	17	22
Navicular				11	11	13	13	15	19	26
Lunate		5	6	12	13	13	14	15	19	23
Triangular	6	8	9	13	13	14	14	15	16	18
Pisiform								6	9	13
Epiphyses										
1st Metacarpal	3	5	7	11	11	11	11	12	14	16
2nd Metacarpal	7	9	9	11	12	12	12	12	14	15
3rd Metacarpal	7	9	9	12	12	12	12	12	15	18
4th Metacarpal	6	8	8	10	11	11	11	11	13	14
ULNA										
DIAMETER, mm.										
Distal epiphysis			1	12	12	12	13	15	15	20
Distal metaphysis	12	14	15	15	13	14	14	16	16	19
RADIUS										
DIAMETER, mm.										
Distal epiphysis	14	18	19	24	24	25	26	27	32	36
WRIST AREA,* sq. mm.	890	1127	1226	1474	1450	1526	1523	1706	1812	2225

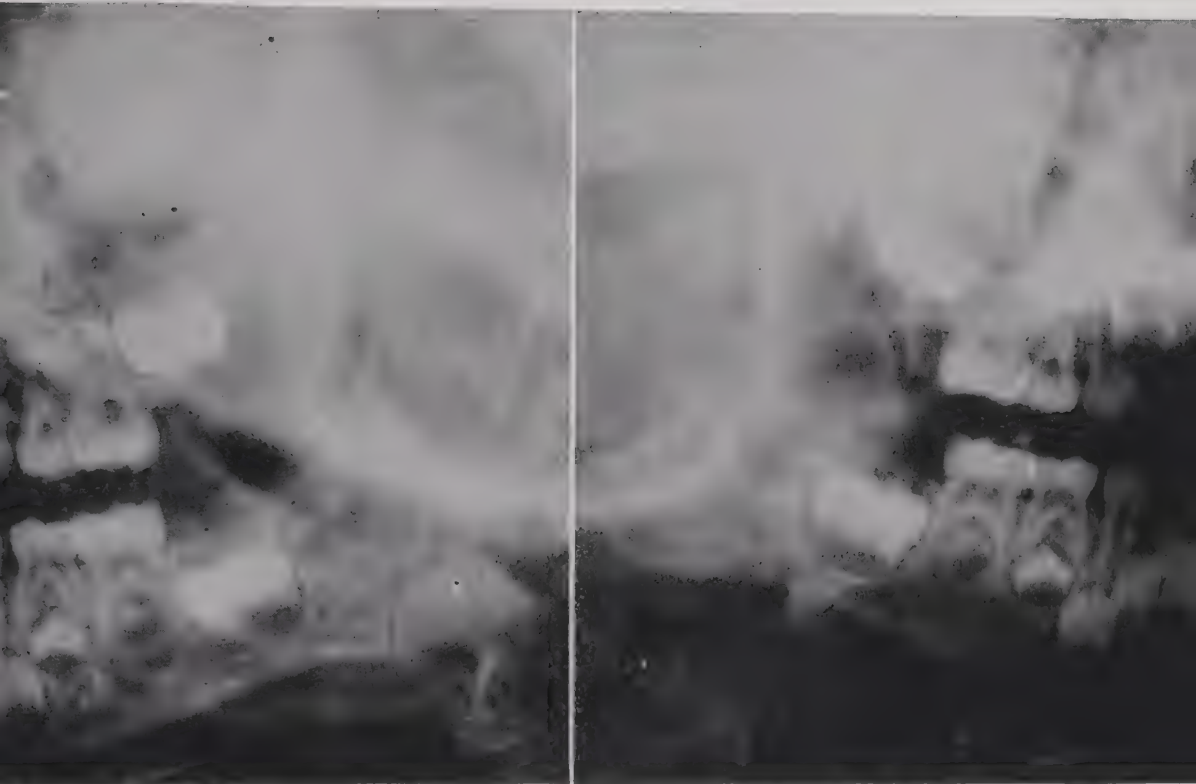
\* Measured with the planimeter using Flory's landmarks (Monographs of the Society for Research in Child Development Vol. I, No. 3, 1936).



DONALD

FIGURE 69. Actual size reproduction of roentgenogram of left hand.  
Chronological age 47 months.





# DONALD

FIGURE 70. Actual size reproduction of roentgenogram of jaws.  
Chronological age 47 months.

TABLE 136

Donald  
57 months

## NITROGEN PARTITION OF URINE

*Values in grams of nitrogen per day*

Date	Total nitrogen	Urea	Ammonia	Creatinine +Creatine	Creatinine	Uric acid
4-14	—	5.40	0.167	0.244	0.156	0.116
4-28	5.89	5.29	0.151	0.268	0.148	0.143
4-29	5.89	4.94	0.139	0.300	0.146	0.140
4-30	6.16	5.24	0.190	0.228	0.161	0.102
5-1	6.05	5.07	0.148	0.332	0.140	0.145
5-2	5.92	5.16	0.187	0.234	0.135	0.140
5-4	5.21	4.53	0.144	0.215	0.124	0.134
5-24	5.99	5.16	0.179	0.448	0.142	0.198
5-28	7.15	6.03	0.134	0.361	0.152	0.139
5-29	7.38	6.56	0.169	0.443	0.168	0.152
5-30	6.14	5.35	0.199	0.460	0.153	—
5-31	6.15	5.47	0.187	0.512	0.153	0.120
6-1	6.56	5.82	0.156	0.518	0.165	—

The age given is the initial age at start of study.

TABLE 137

Donald  
57 months

BODY LENGTH AND WEIGHT—INTAKE AND ELIMINATION

Date	Re-cumbent length*	Weight*	INTAKE		AVERAGE DAILY HEAT OF COM-BUSTION		FECES			Laxa-tion rate‡
			AVERAGE DAILY		Intake	Feces	AVERAGE DAILY			
			Dry wt.*	Total water†			Wet wt.	Dry wt.*	Fat	
mo.-day	cm.	kg.	gm.	gm.	Cal.	Cal.	gm.	gm.	gm.	
4-23	108	19.50	400	1463	1888	98	127.8	19.0	2.1	1.2
4-28	108	19.70	413	1597	2000	100	103.6	19.4	2.3	1.4
5-8	109	20.00	388	1610	1895	102	115.6	19.0	2.4	1.0
5-13	109	20.05	350	1479	1742	85	—	16.4	1.6	1.3
5-18	109	20.10	385	1267	1843	106	111.4	20.6	2.1	1.2
5-23	109	20.15	375	1245	1819	91	93.0	17.7	1.8	1.0
5-28	110	20.20	358	1233	1798	79	78.4	14.4	1.6	1.0
6-7	110	20.25	372	1350	1831	91	88.0	16.8	1.8	1.0
6-12	110	20.27	353	1577	1797	77	73.4	15.4	1.7	0.8
6-17	110	20.30	362	1487	1830	64	—	11.8	1.5	1.0
6-22	110	20.30	344	1557	1730	85	87.8	16.6	1.8	0.8

The age given is the initial age at start of study. Dates given are first days of five-day balance periods.  
\* See Table 132 for actual values and method of smoothing.  
† Based on alcohol-dried food and oven-dried feces.  
‡ Drinking water plus water in food.  
‡ Average number of defecations per day.

TABLE 138

Donald  
57 months

POSITIVE MINERALS IN INTAKE, URINE, FECES

Values are averages per day

Date	CALCIUM			MAGNESIUM			SODIUM			POTASSIUM		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
4-23	991	85	444	310	73	180	2312	1580	54	2324	1107	384
4-28	991	86	451	310	64	172	2312	1695	47	2324	2340	386
5-8	991	77	447	310	67	173	2312	1389	89	2324	1769	415
5-13	991	55	434	310	64	162	2312	1309	27	2324	2306	505
5-18	991	72	546	310	67	192	2312	1595	65	2324	2486	460
5-23	991	68	444	310	61	176	2312	1417	38	2324	2140	396
5-28	991	76	381	310	60	147	2312	1502	39	2324	1409	380
6-7	991	70	465	310	58	190	2312	1340	48	2324	1876	464
6-12	991	74	426	310	59	172	2312	1570	31	2324	2544	423
6-17	991	78	321	310	64	126	2312	1481	15	2324	2084	317
6-22	991	85	433	310	67	163	2312	1609	44	2324	2600	443

The age given is the initial age at start of study. Dates given are first days of five-day balance periods.

TABLE 139

Donald  
57 months

## NITROGEN AND NEGATIVE MINERALS IN INTAKE, URINE, FECES

*Values are averages per day*

Date	NITROGEN			PHOSPHORUS			CHLORINE			SULFUR		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
4-23	8.43	5.76	0.94	1348	562	302	3515	3085	43	724	362	109
4-28	8.43	5.98	0.97	1348	538	318	3515	2836	28	724	392	114
5-8	8.43	5.91	1.17	1348	617	313	3515	2754	41	724	366	104
5-13	8.43	6.25	1.14	1348	472	311	3515	2520	84	724	424	95
5-18	8.43	6.37	1.27	1348	556	405	3515	2640	81	724	414	105
5-23	8.43	6.58	1.01	1348	588	360	3515	2472	49	724	430	92
5-28	8.43	6.67	0.93	1348	616	280	3515	2964	42	724	426	70
6-7	8.43	6.15	1.07	1348	556	370	3515	2520	51	724	394	95
6-12	8.43	6.55	1.04	1348	706	325	3515	3000	37	724	422	76
6-17	8.43	6.79	0.81	1348	631	257	3515	2694	21	724	450	57
6-22	8.43	7.42	1.01	1348	631	334	3515	3240	41	724	481	81

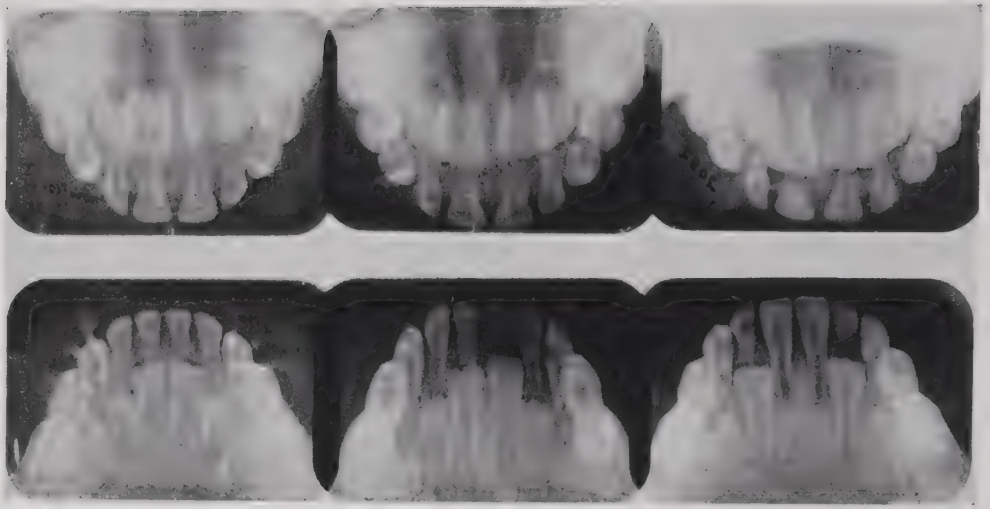
The age given is the initial age at start of study. Dates given are first days of five-day balance periods.



DONALD

FIGURE 71. Actual size reproduction of roentgenogram of jaws.  
Chronological age 58 months.





DONALD

FIGURE 72. Roentgenograms of teeth, ages 47, 58 and 68 months.



DONALD

FIGURE 73. Postural footprints, age 60 months.



FIGURE 74. DONALD, age 57 months.



DONALD

FIGURE 75. Actual size reproduction of roentgenogram of left hand.  
Chronological age 58 months.



DONALD

FIGURE 76. Actual size reproduction of roentgenogram of left hand.  
Chronological age 68 months.





DONALD

FIGURE 77. Actual size reproduction of roentgenogram of jaws.  
Chronological age 68 months.



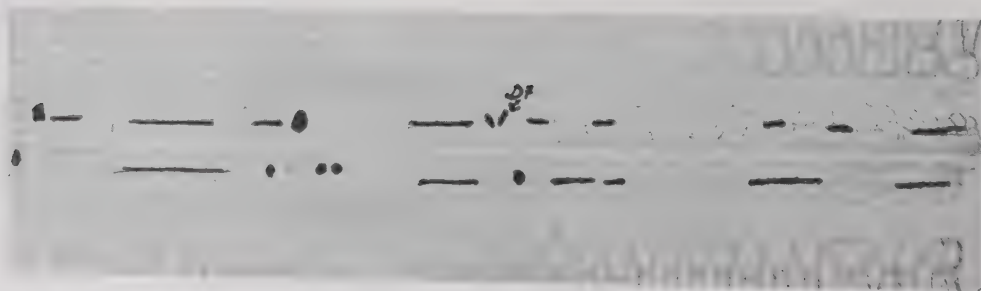
DONALD

FIGURE 78. Actual size reproduction of roentgenogram of jaws.  
Chronological age 101 months.



DONALD

FIGURE 79. Roentgenograms of teeth, age 101 months.



DONALD

FIGURE 80. Dental examination, age 100 months.



DONALD

FIGURE 81. Actual size reproduction of roentgenogram of left hand.  
Chronological age, 95 months.





DONALD

FIGURE 82. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 95 months.



DONALD

FIGURE 83. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 95 months.



DONALD

FIGURE 84. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 95 months.





DONALD

FIGURE 85. Actual size reproduction of roentgenogram of left hip.  
Chronological age 95 months.



DONALD

FIGURE 86. Actual size reproduction of roentgenogram of left knee.  
Chronological age 95 months.



DONALD

FIGURE 87. Actual size reproduction of roentgenogram of left knee.  
Chronological age 95 months.





DONALD

FIGURE 88. Actual size reproduction of roentgenogram of left foot.  
Chronological age 95 months.



DONALD

FIGURE 89. Actual size reproduction of roentgenogram of left foot.  
Chronological age 95 months.

## SCORES ON INDIVIDUAL ITEMS OF

Date	Relaxed = 1 Tense = 5					Energetic = 1 Listless = 5					Good natured = 1 Quarrelsome = 5					Interested = 1 Apathetic = 5					Restless = 1 Tired = 5				
	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E
mo.-days																									
9-30	4	2	4	4	-	4	2	4	1	-	3	2	4	2	-	2	2	2	1	-	3	1	2	1	-
10-1	4	-	3	1	2	2	-	3	2	5	4	-	3	4	5	3	-	2	4	2	2	-	2	4	2
10-2	-	1	2	1	1	-	2	4	4	4	-	1	2	1	1	-	2	2	2	2	-	1	2	2	1
10-3	-	1	2	2	4	-	2	4	4	2	-	4	2	4	4	-	4	3	1	2	-	1	2	1	2
10-4	-	2	2	2	1	-	2	4	2	2	-	2	2	1	1	-	2	2	1	1	-	1	2	1	1
10-5	2	1	2	1	2	2	2	2	4	3	3	2	2	4	2	2	2	2	1	1	2	1	2	1	2
10-6	2	2	2	5	-	2	2	3	1	-	2	2	2	4	-	1	2	2	1	-	2	1	2	1	-
10-7	4	1	3	5	-	2	4	4	1	-	4	5	2	5	-	3	2	2	2	-	4	1	2	1	-
10-8	4	-	2	2	1	2	-	2	2	2	1	-	2	2	1	1	-	2	2	1	1	-	2	1	1
10-9	2	1	2	4	1	1	2	2	1	2	1	2	2	4	1	1	2	2	1	2	2	1	2	1	2
10-10	2	1	2	4	1	2	1	4	1	2	2	2	2	1	1	1	1	2	1	1	2	1	2	1	1
10-11	-	4	-	1	-	-	2	-	1	-	-	4	-	4	-	4	-	1	-	-	1	-	1	-	-
10-12	-	1	2	4	1	-	1	2	1	1	-	1	2	4	2	-	1	2	2	1	-	1	2	1	1
10-13	-	-	-	2	3	-	-	-	4	1	-	-	-	2	4	-	-	-	1	-	-	-	-	1	4
10-14	-	1	2	2	-	-	1	3	2	-	-	1	2	2	-	-	1	2	2	-	-	1	2	1	-
10-15	-	4	4	5	-	-	4	3	1	-	-	4	4	4	-	-	4	2	2	-	-	2	2	1	-
10-16	4	1	4	5	1	2	2	2	1	1	4	4	2	1	1	3	1	2	1	1	4	1	2	1	1
10-17	-	2	2	4	2	-	2	2	1	4	-	4	2	1	2	-	1	2	1	2	-	1	2	1	2
10-18	-	2	-	2	1	-	2	-	2	2	-	4	-	2	1	-	4	-	2	1	-	1	-	1	1
10-19	-	2	2	4	-	-	2	3	2	-	-	4	2	2	-	-	1	2	1	-	-	1	2	1	-
10-20	-	-	2	2	-	-	-	2	2	-	-	-	2	2	-	-	-	2	1	-	-	-	2	1	-
10-21	2	4	2	4	2	2	2	2	2	2	2	2	2	1	2	1	2	2	1	1	2	2	2	1	1
10-22	-	-	2	2	1	-	-	2	2	1	-	-	2	1	1	-	-	2	1	1	-	-	2	1	1
10-23	-	2	2	2	2	-	2	2	2	2	-	2	2	1	2	-	2	2	1	2	-	2	2	1	2
<hr/>																									
12-1	-	1	2	-	1	-	1	2	-	2	-	1	2	-	1	-	1	1	-	1	-	1	1	-	1
12-2	-	1	2	-	1	-	1	2	-	2	-	1	2	-	1	-	1	1	-	1	-	1	1	-	1
12-3	-	1	1	-	1	-	1	1	-	1	-	1	1	-	1	-	1	1	-	1	-	1	1	-	1
12-4	-	1	2	-	1	-	1	2	-	2	-	1	2	-	1	-	1	2	-	1	-	1	2	-	1
12-5	2	-	2	2	1	1	-	2	2	2	1	2	2	1	1	1	-	2	1	1	1	-	2	1	1
12-6	2	1	-	2	1	1	1	-	2	2	1	2	-	1	1	1	1	-	1	1	1	1	-	1	1
12-7	2	2	2	-	2	1	2	1	-	2	1	2	2	-	1	1	2	1	-	1	1	2	1	-	1
12-8	1	2	-	4	-	1	2	-	1	-	1	2	-	4	-	1	2	-	2	-	1	2	-	1	-
12-9	4	2	-	-	2	-	1	-	1	-	4	-	4	-	1	-	2	-	-	-	1	-	2	-	-
12-10	3	1	2	2	2	1	2	2	2	2	1	2	2	2	2	1	1	1	2	1	1	1	2	1	1
12-11	-	1	2	-	2	-	2	2	-	2	-	2	2	-	2	-	1	1	-	2	-	1	2	-	2
12-12	2	1	4	-	2	1	2	2	-	2	1	2	2	-	2	1	1	1	-	1	1	1	4	-	1
12-13	-	2	-	2	1	-	2	-	2	2	-	2	-	1	1	-	2	-	1	1	-	2	-	1	1
12-14	2	1	2	2	1	1	1	1	2	1	1	2	1	2	1	1	1	2	2	1	1	1	2	1	1
12-15	2	2	2	-	1	1	2	1	-	1	1	2	1	-	1	1	2	1	-	1	1	2	1	-	1
12-16	2	2	2	2	-	1	1	1	2	-	2	2	1	2	-	1	2	1	2	-	1	2	1	1	-
12-17	2	1	2	-	1	1	2	2	-	1	1	2	2	-	1	1	1	2	-	1	1	1	2	-	1
12-18	3	1	2	-	1	1	1	2	-	2	1	1	2	2	-	1	1	1	2	-	1	1	1	2	-
12-19	2	1	2	2	1	1	1	2	2	1	1	2	2	1	2	1	2	2	1	1	1	2	2	1	1
12-20	2	-	-	1	2	1	-	-	2	2	1	-	-	1	1	1	-	-	1	1	1	-	1	1	1
12-21	2	1	1	1	-	1	1	1	2	-	1	1	1	1	-	1	1	2	1	-	1	1	2	1	-
12-22	2	1	3	-	2	2	1	1	-	2	2	2	2	-	2	1	1	2	-	1	1	1	2	-	1
12-23	2	1	2	-	-	1	1	2	-	-	1	2	2	-	-	1	1	2	-	-	1	1	2	-	-
12-24	1	1	4	-	1	1	1	2	-	1	1	2	2	-	1	1	1	1	-	1	1	1	2	-	1
12-25	1	2	4	-	1	1	2	1	-	1	1	2	2	-	1	1	1	2	-	1	1	1	4	-	1



# THE EMOTIONAL REACTION SHEETS

Cooperative=1 Stubborn =5					Secure =1 Apprehensive =5					Calm =1 Excitable=5					Happy =1 Dejected =5					Affectionate =1 Indifferent =5					Easy-going=1 Irritable =5						
A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E		
4	1	2	1	-	2	2	2	4	-	4	2	3	5	-	2	2	3	1	-	4	2	5	1	-	4	1	4	4	-		
2	-	2	4	2	3	-	2	4	2	4	-	3	4	2	2	-	2	2	1	2	4	-	5	2	5	3	-	2	3	2	1
-	2	2	2	2	-	2	2	4	1	-	2	2	3	1	-	2	2	2	1	2	-	4	4	2	2	-	2	3	2	1	
-	2	2	2	1	-	4	2	2	1	-	5	2	2	4	-	2	2	2	2	2	-	4	4	2	4	-	4	2	1	3	
-	2	2	2	1	-	1	2	4	1	-	2	2	4	-	2	2	2	1	1	-	2	5	4	2	-	2	2	2	1	1	
2	1	2	4	2	3	2	2	4	2	4	2	2	2	3	3	1	2	1	1	4	2	5	4	3	3	2	2	2	4	-	
2	1	1	2	-	2	2	2	2	-	3	2	2	5	-	2	2	2	1	-	4	2	5	4	3	3	2	2	2	2	-	
2	2	1	4	-	4	2	2	4	-	3	4	2	5	-	4	4	2	1	-	3	2	5	4	-	4	4	2	4	-	-	
1	-	2	1	1	1	-	2	1	1	2	-	2	4	1	1	-	2	1	1	2	5	2	2	2	1	-	2	2	1	-	
1	2	1	4	1	1	1	2	4	1	1	4	1	5	2	2	2	2	2	1	2	2	5	2	2	1	3	2	4	1	-	
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-	1	-	2	-	-	1	-	1	-	-	-	-	5	-	-	2	-	1	-	-	2	1	-	-	4	-	4	-	-	-	
-	1	2	4	1	-	1	2	1	1	-	2	4	5	5	-	2	2	1	1	-	2	5	4	2	-	2	2	4	2	-	
-	-	-	1	4	-	-	-	-	1	3	-	-	-	2	-	-	-	1	3	-	-	-	2	4	-	-	-	2	5	-	
-	1	1	2	-	-	1	2	1	-	-	2	1	4	-	-	2	2	1	-	-	2	5	4	-	-	2	2	2	-	-	
-	1	4	2	-	-	2	2	2	-	-	4	4	5	-	-	4	4	1	-	-	4	5	4	-	-	4	2	2	-	-	
5	1	4	1	1	3	1	2	1	1	5	4	4	5	1	4	3	3	1	1	4	4	5	1	1	5	4	4	1	1	-	
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-	-	2	1	-	-	-	2	1	-	-	-	-	1	5	-	-	2	1	-	-	-	5	1	-	-	-	2	2	-	-	
2	2	2	1	1	2	2	2	1	1	3	4	1	5	2	2	3	2	1	1	3	4	5	1	2	2	4	2	2	2	2	
-	-	2	1	1	-	-	2	1	1	-	1	2	2	2	-	2	-	1	1	-	5	1	1	-	-	2	2	2	1	-	
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-	2	2	1	1	-	2	2	1	2	-	2	2	2	4	-	2	2	1	-	-	-	5	1	-	-	-	2	2	-	-	
-	1	1	2	-	-	1	2	-	-	1	2	-	4	-	-	1	2	-	-	-	2	-	2	-	-	2	-	4	-	-	
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1	-	2	-	-	1	-	-	-	-	4	4	-	-	-	2	-	4	-	-	4	-	5	-	3	-	4	-	-	-	-	
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1	1	2	-	1	1	1	2	-	1	3	1	4	-	2	1	2	3	-	1	3	1	4	-	2	1	1	2	-	2	-	
-	2	-	1	1	-	2	-	2	1	-	2	-	4	5	-	2	-	1	1	-	2	-	2	1	2	2	-	3	1	-	
1	1	2	2	1	1	1	2	1	1	3	1	2	2	1	1	2	2	2	1	3	2	2	2	2	1	2	2	2	1	-	
1	2	1	-	1	1	2	1	-	1	2	2	2	-	1	1	2	2	-	-	2	1	4	-	1	2	2	2	-	1	-	
1	1	2	-	1	1	1	2	1	-	1	2	2	2	-	2	1	2	2	-	1	2	1	4	-	2	2	2	2	-	2	
1	1	2	-	1	1	1	2	-	1	2	1	3	-	4	1	1	1	2	-	1	2	1	4	-	1	1	1	2	-	1	
1	2	2	1	1	1	2	2	2	1	2	1	4	1	2	1	2	2	1	1	3	1	2	1	2	1	1	2	1	2	-	
1	-	-	1	1	1	-	-	2	1	2	-	-	2	5	1	-	1	1	-	1	1	2	-	2	2	1	1	2	-	1	
1	1	2	1	-	1	1	2	1	-	2	1	4	1	-	1	2	2	1	-	1	1	2	1	-	1	2	2	2	-	2	
1	1	2	-	1	1	1	2	-	1	4	1	2	-	4	-	1	2	-	1	-	1	4	-	2	2	1	2	-	2	-	
1	1	2	-	-	1	1	2	-	-	1	2	2	-	-	1	2	2	-	-	1	1	2	-	1	1	2	-	-	-	1	
1	1	1	-	1	1	1	2	-	1	3	2	5	-	5	1	2	2	-	1	1	1	2	-	1	1	1	2	-	-	1	
1	1	2	-	1	1	1	2	-	1	4	4	4	-	5	1	2	2	-	1	1	1	4	-	1	1	1	2	-	-	1	

The emotional reaction sheets (see page 64) list eleven pairs of contrasting characteristics. Five observers rated the children daily from one to five, with one as favorable, for each of the eleven characteristics. Each sheet was then totaled and the average score determined. For 4,649 daily scores for the eleven characteristics, combined, for eleven children, the daily scores ranged from 1.000 to 4.273 with an average of 1.716.

## BODY LENGTH AND WEIGHT — INTAKE AND ELIMINATION

Date	Recumbent length*	Weight*	INTAKE			AVERAGE DAILY HEAT OF COMBUSTION			FECES				
			AVERAGE DAILY			In-take	Urine	Feces	AVERAGE DAILY			Laxation rate†	Elimination time‡
			Dry wt.‡	Total water†	Fat				Wet wt.	Dry wt.‡	Fat		
mo.day	cm.	kg.	gm.	gm.	gm.	Cal.	Cal.	Cal.	gm.	gm.	gm.		hours
9-30	135	27.79	364	1382	69.5	1899	73	95	77.0	20.0	2.3	1.6	24
10-5	136	27.79	365	1280	69.5	1905	72	76	88.6	16.0	2.0	1.4	35
10-10	136	27.79	363	1289	69.5	1897	72	44	56.2	13.0	1.4	1.2	13
10-15	136	27.69	366	1245	69.5	1908	73	84	68.0	18.0	2.3	1.4	35
10-20	136	27.65	361	1248	69.5	1887	72	77	65.8	16.0	1.9	1.2	48
10-25	136	27.50	363	1310	69.5	1895	85	66	68.8	14.0	1.7	1.2	46
10-30	136	27.56	368	1215	69.5	1913	79	65	67.8	14.0	1.9	1.4	25
11-4	137	27.57	387	1326	71.1	1988	95	68	67.6	14.0	1.9	1.0	24
11-9	137	27.58	386	1254	71.1	1986	60	60	65.8	14.0	1.9	1.6	24
11-14	137	27.58	383	1290	71.1	1971	64	69	78.6	11.0	1.3	1.0	34
11-19	137	27.53	393	1314	71.1	2011	82	63	71.0	14.0	2.0	1.4	49
11-24	137	27.60	387	1400	71.1	1990	80	—	77.0	14.0	2.1	1.2	51
11-29	138	27.73	382	1344	71.1	1969	78	47	50.4	12.0	1.7	1.4	48
12-4	138	27.89	433	1417	99.6	2274	82	73	82.0	16.0	2.7	1.0	49
12-9	138	28.05	432	1423	99.6	2271	92	71	74.0	20.0	3.5	1.6	25
12-14	138	27.97	434	1467	99.6	2277	78	69	69.0	14.0	2.4	1.0	59
12-19	138	27.90	432	1437	99.6	2272	84	60	77.0	14.0	2.2	1.4	23
12-24	138	27.69	443	1487	99.6	2313	71	60	77.0	14.0	2.2	1.4	24
12-29	138	27.64	434	1437	99.6	2281	86	88	137.2	18.0	2.4	1.8	33
1-3	138	27.60	430	1563	99.6	2264	89	80	73.4	17.0	2.6	1.6	11
1-8	138	27.71	434	1528	99.6	2281	87	101	84.4	20.0	3.4	1.2	48
1-13	138	27.82	441	1640	99.6	2282	—	82	62.2	19.0	3.0	1.6	49
1-18	138	27.83	445	1576	99.6	2298	81	81	61.8	18.0	2.7	1.2	31
1-23	139	27.87	438	1508	99.6	2269	88	82	58.2	15.0	2.3	1.2	48
1-28	139	27.85	440	1503	99.6	2280	79	94	76.6	19.0	2.9	1.2	32
2-2	139	27.98	444	1508	99.6	2293	88	92	63.6	16.0	2.6	1.2	47
2-7	139	28.12	450	1581	102.1	2300	81	97	71.2	22.0	3.1	1.6	48
2-12	139	28.27	456	1572	102.1	2320	89	85	90.0	21.0	3.0	1.4	48
2-17	139	28.42	450	1600	102.1	2297	85	80	65.0	15.0	2.2	1.2	48
2-22	139	28.45	451	1673	102.1	2301	78	107	71.2	26.0	3.4	1.4	32
2-27	139	28.50	457	1656	102.1	2337	88	87	75.2	19.0	2.7	1.0	48
3-3	139	28.53	436	1394	102.7	2240	80	99	78.8	23.0	3.1	1.2	24
3-8	139	28.59	441	1519	102.7	2257	85	105	80.2	23.0	3.1	1.6	12
3-13	139	28.62	443	1506	102.7	2266	85	84	65.8	17.0	2.6	2.0	24
3-18	139	28.44	430	1469	103.2	2258	94	64	60.6	13.0	2.3	1.4	24
3-23	139	28.48	436	1494	103.2	2259	84	110	82.2	21.0	4.2	1.6	25
3-28	139	28.51	431	1468	103.2	2242	86	90	73.4	18.0	2.6	1.6	49
4-2	139	28.69	434	1365	103.2	2252	83	75	69.4	16.0	2.4	1.4	50
4-7	139	28.72	431	1415	103.2	2242	84	84	76.0	15.0	2.1	1.6	34
4-12	139	28.74	440	1364	103.2	2278	83	104	86.4	20.0	2.7	1.2	33
4-17	139	28.97	436	1461	103.2	2262	85	102	75.0	20.0	3.2	1.2	24
4-22	139	29.15	431	1434	103.2	2241	89	96	59.4	24.0	3.7	1.4	49
4-27	139	29.33	433	1574	103.2	2249	82	86	70.6	18.0	2.8	1.4	49
5-2	139	29.25	440	1564	103.2	2278	83	84	51.4	19.0	3.1	1.6	35
5-7	139	29.17	434	1906	103.2	2252	89	96	85.4	18.0	3.1	1.0	25

The age given is the initial age at start of study. Dates given are first days of five-day balance periods. Italic figures were omitted from calculations of the averages given in Volume I.

\* See Table 132 for actual values and method of smoothing.

† Based on alcohol-dried food and oven-dried feces.

‡ Drinking water plus water in food.

§ Average number of defecations per day.

¶ Elapsed time between ingestion and defecation of marker used to separate feces of 5-day periods

POSITIVE MINERALS IN INTAKE, URINE, FECES

*Values are averages per day*

Date	CALCIUM			MAGNESIUM			SODIUM			POTASSIUM		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo. day	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
9-30	767	174	746	266	72	187	2176	1864	00	2440	1955	340
10-5	767	177	722	266	72	210	2176	2165	00	2440	2080	345
10-10	767	182	497	266	71	141	2176	1710	00	2440	1880	190
10-15	767	152	601	266	69	165	2176	1996	00	2440	2265	274
10-20	767	158	574	266	67	174	2176	2123	00	2440	1912	266
10-25	767	159	611	266	69	179	2176	1840	00	2440	1960	282
10-30	767	166	626	266	65	213	2176	1886	00	2440	2049	260
11-4	772	154	603	299	50	172	2180	2005	23	2822	2548	227
11-9	772	141	549	299	69	181	2180	1811	32	2822	2100	211
11-14	772	124	641	299	72	197	2180	1823	31	2822	2360	246
11-19	772	129	601	299	58	194	2180	2016	28	2822	2257	258
11-24	772	144	666	299	69	216	2180	1676	26	2822	2625	271
11-29	772	132	617	299	54	190	2180	1918	12	2822	1890	180
12-4	1259	144	976	315	76	147	2445	2138	00	3013	2365	301
12-9	1259	138	1020	315	73	200	2445	2210	00	3013	2418	240
12-14	1259	103	1029	315	43	171	2445	2082	00	3013	2579	230
12-19	1259	125	884	315	90	156	2445	2239	14	3013	2506	240
12-24	1259	125	884	315	74	156	2445	2138	14	3013	2517	240
12-29	1259	125	980	315	95	197	2445	2356	83	3013	2652	352
1-3	1259	111	1043	315	83	197	2445	1980	00	3013	2630	265
1-8	1259	112	1007	315	90	98	2445	2194	20	3013	2440	240
1-13	1259	120	987	315	95	114	2445	2127	12	3013	2589	223
1-18	1259	132	958	315	88	135	2445	2195	12	3013	2524	225
1-23	1259	138	891	315	89	122	2445	2291	14	3013	2840	212
1-28	1259	147	946	315	77	149	2445	2300	20	3013	2582	263
2-2	1259	151	944	315	86	148	2445	2279	12	3013	2685	239
2-7	1312	131	1044	378	92	115	2823	2461	18	3221	2740	211
2-12	1312	135	966	378	87	159	2823	2584	25	3221	2677	258
2-17	1312	138	984	378	81	147	2823	2516	15	3221	2697	153
2-22	1312	131	1071	378	86	221	2823	2493	28	3221	2757	267
2-27	1312	137	967	378	86	148	2823	2436	23	3221	2575	217
3-3	1317	138	963	385	89	120	2814	2625	26	3358	2735	240
3-8	1317	139	1056	385	89	126	2814	2513	19	3358	2874	244
3-13	1317	151	969	385	103	113	2814	2587	14	3358	3091	240
3-18	1324	150	1025	331	99	169	2438	2082	15	3249	2781	222
3-23	1267	143	955	331	79	97	2438	2045	27	3249	2521	231
3-28	1267	131	1006	331	83	107	2438	2262	29	3249	2632	223
4-2	1267	141	973	331	82	106	2438	2142	00	3249	2658	220
4-7	1267	145	1043	331	78	215	2438	2064	16	3249	2659	239
4-12	1267	169	1013	331	85	191	2438	2148	00	3249	2640	270
4-17	1267	184	991	331	83	188	2438	1910	19	3249	2622	210
4-22	1267	149	1083	331	81	208	2438	2260	13	3249	2811	172
4-27	1267	137	1010	331	76	199	2438	2049	00	3249	2489	216
5-2	1267	151	965	331	79	188	2438	2218	00	3249	2623	172
5-7	1267	136	1013	331	88	200	2438	1870	30	3249	2673	265

The age given is the initial age at start of study. Dates given are first days of five-day balance periods.



TABLE 143

Donald  
99 months

## NITROGEN AND NEGATIVE MINERALS IN INTAKE, URINE, FECES

*Values are averages per day*

Date	NITROGEN			PHOSPHORUS			CHLORINE			SULFUR		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo-day	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
9-30	10.32	8.78	1.30	1076	639	482	3412	2916	11	692	600	105
10-5	10.32	9.09	1.44	1076	781	431	3412	3024	26	692	608	92
10-10	10.32	8.99	0.98	1076	655	322	3412	2748	16	692	596	66
10-15	10.32	8.87	1.23	1076	685	475	3412	3018	18	692	654	103
10-20	10.32	9.25	1.08	1076	630	399	3412	3279	22	692	631	90
10-25	10.32	9.28	1.02	1076	724	374	3412	2742	24	692	659	71
10-30	10.32	9.54	0.99	1076	772	420	3412	2970	25	692	653	80
11-4	10.43	9.50	0.92	1103	645	312	3524	3244	25	699	644	70
11-9	10.43	9.20	0.83	1103	597	285	3524	2982	22	699	621	64
11-14	10.43	9.22	1.04	1103	657	349	3524	3078	55	699	612	76
11-19	10.43	9.06	1.04	1103	540	316	3524	3413	25	699	602	64
11-24	10.43	10.14	1.06	1103	721	406	3524	2642	23	699	678	63
11-29	10.43	9.41	0.79	1103	715	316	3524	3038	12	699	602	52
12-4	12.28	9.95	1.16	1484	733	378	3826	3420	26	824	639	71
12-9	12.28	10.54	0.98	1484	780	388	3826	3370	36	824	689	65
12-14	12.28	10.66	0.98	1484	829	360	3826	3182	73	824	720	67
12-19	12.28	10.71	1.08	1484	870	313	3826	3376	61	824	703	64
12-24	12.28	10.66	1.08	1484	713	313	3826	3370	61	824	707	64
12-29	12.28	11.27	1.41	1484	789	370	3826	3494	99	824	739	102
1-3	12.28	11.14	1.24	1484	806	418	3826	2946	100	824	748	88
1-8	12.28	10.88	1.23	1484	874	502	3826	3360	65	824	719	103
1-13	12.28	10.66	0.98	1484	815	409	3826	3422	45	824	687	75
1-18	12.28	10.97	1.05	1484	849	459	3826	3292	31	824	706	91
1-23	12.28	11.40	0.95	1484	782	441	3826	3600	42	824	748	85
1-28	12.28	10.92	1.17	1484	834	468	3826	3619	65	824	713	104
2-2	12.28	11.42	1.13	1484	935	425	3826	3583	30	824	744	85
2-7	12.57	11.01	1.28	1518	887	466	4286	3642	43	852	743	106
2-12	12.57	10.60	1.55	1518	905	395	4286	3780	41	852	715	100
2-17	12.57	10.75	1.14	1518	882	369	4286	3775	46	852	723	75
2-22	12.57	10.52	1.50	1518	950	472	4286	3763	49	852	709	127
2-27	12.57	11.14	1.22	1518	1028	406	4286	3625	66	852	758	94
3-3	12.64	10.85	1.32	1583	977	454	4369	4074	74	858	741	108
3-8	12.64	11.00	1.45	1583	910	519	4369	3875	50	858	736	115
3-13	12.64	11.33	1.15	1583	1079	370	4369	4032	55	858	763	86
3-18	12.35	11.04	0.98	1496	1067	334	3832	3307	25	830	766	59
3-23	12.35	10.78	1.15	1496	888	494	3832	3354	117	830	742	91
3-28	12.35	11.03	1.23	1496	1038	478	3832	3444	33	830	786	97
4-2	12.35	10.38	1.19	1496	883	381	3832	3528	36	830	662	76
4-7	12.35	10.39	1.29	1496	846	423	3832	3366	30	830	672	86
4-12	12.35	10.78	1.38	1496	912	494	3832	3510	35	830	737	112
4-17	12.35	11.09	1.12	1496	1022	527	3832	3150	27	830	754	101
4-22	12.35	10.84	1.15	1496	895	546	3832	3600	16	830	734	95
4-27	12.35	10.24	1.22	1496	893	441	3832	3300	30	830	650	89
5-2	12.35	10.69	0.93	1496	895	460	3832	3512	78	830	683	78
5-7	12.35	10.35	1.14	1496	962	466	3832	3093	92	830	694	96

The age given is the initial age at start of study. Dates given are first days of five-day balance periods.

TABLE 144

Donald  
99 months

## COMPLEX CARBOHYDRATES IN INTAKE AND FECES

*Values in grams per day*

Date	LIGNIN		CELLULOSE		HEMICELLULOSE		
	Intake	Feces	Intake	Feces	INTAKE		Feces
					Total	Stable	
9-30	1.33	1.98	2.32	0.79	2.47	1.89	1.17
10-5	1.33	1.34	2.32	0.58	2.47	1.89	0.85
10-10	1.33	1.12	2.32	0.34	2.47	1.89	0.89
10-15	1.33	1.64	2.32	0.55	2.47	1.89	1.16
10-20	1.33	1.42	2.32	0.55	2.47	1.89	0.85
10-25	1.33	1.24	2.32	0.44	2.47	1.89	0.77
10-30	1.33	1.48	2.32	0.40	2.47	1.89	0.79
11-4	1.79	1.97	2.56	0.55	2.62	2.02	0.84
11-9	1.79	1.75	2.56	0.63	2.62	2.02	0.76
11-14	1.79	1.12	2.56	0.30	2.62	2.02	0.64
11-19	1.76	1.79	2.50	0.53	2.44	1.82	0.70
11-24	1.83	1.62	2.61	0.46	2.80	2.22	0.85
11-29	1.76	1.69	2.50	0.54	2.44	1.82	0.45
12-4	1.33	1.27	2.32	0.49	2.47	1.89	0.75
12-9	1.33	1.74	2.32	0.62	2.47	1.89	0.95
12-14	1.33	1.29	2.32	0.40	2.47	1.89	0.69
12-19	1.33	1.12	2.32	0.23	2.47	1.89	0.52
12-24	1.33	1.60	2.32	0.53	2.47	1.89	0.89
12-29	1.33	1.29	2.32	0.43	2.47	1.89	0.79
1-3	1.33	1.50	2.32	0.58	2.47	1.89	0.83
1-8	1.33	1.78	2.32	0.53	2.47	1.89	1.02
1-13	1.33	1.97	2.32	0.52	2.47	1.89	1.03
1-18	1.29	1.67	2.27	0.48	2.28	1.68	0.87
1-23	1.33	1.42	2.32	0.32	2.47	1.89	0.77
1-28	1.33	1.75	2.32	0.54	2.47	1.89	0.98
2-2	1.33	1.26	2.32	0.38	2.47	1.89	0.83
2-7	1.46	1.95	2.61	0.50	2.61	1.98	1.14
2-12	1.46	1.80	2.61	0.58	2.61	1.98	0.82
2-17	1.46	1.64	2.61	0.40	2.61	1.98	0.75
2-22	1.46	2.25	2.61	0.67	2.61	1.98	1.26
2-27	1.46	1.92	2.61	0.27	2.61	1.98	0.94
3-3	1.46	2.55	2.61	0.66	2.61	1.98	1.01
3-8	1.46	2.27	2.61	0.48	2.61	1.98	1.14
3-13	1.46	1.58	2.61	0.32	2.61	1.98	0.85
3-18	1.33	1.24	2.32	0.35	2.47	1.89	0.67
3-23	1.33	2.18	2.32	0.45	2.47	1.89	0.93
3-28	1.36	1.53	2.37	0.48	2.65	2.09	0.96
4-2	1.33	1.73	2.32	0.34	2.47	1.89	0.90
4-7	1.33	1.41	2.32	0.38	2.47	1.89	0.83
4-12	1.33	1.67	2.32	0.58	2.47	1.89	0.90
4-17	1.33	1.80	2.32	0.60	2.47	1.89	1.08
4-22	1.33	2.34	2.32	0.77	2.47	1.89	1.26
4-27	1.33	1.81	2.32	0.44	2.47	1.89	0.96
5-2	1.33	1.80	2.32	0.23	2.47	1.89	1.01
5-7	1.33	1.50	2.32	0.45	2.47	1.89	0.93

TABLE 145

Donald  
99 months

## IRON IN INTAKE, URINE, FECES

*Values are averages per day*

Date	Intake	Urine	Feces	Date	Intake	Urine	Feces	Date	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mo.-day	mg.	mg.	mg.	mo.-day	mg.	mg.	mg.
9-30	8.19	0.19	9.50	12-14	8.43	0.34	5.48	2-27	9.44	0.10	7.01
10-5	8.19	0.03	8.34	12-19	8.43	0.15	5.27	3-3	9.44	0.15	9.49
10-10	8.19	—	5.40	12-24	8.43	0.12	5.27	3-8	9.44	1.21	8.80
10-15	8.19	—	9.00	12-29	8.43	0.04	5.78	3-13	9.44	1.93	6.91
10-20	8.19	0.20	6.62	1-3	8.43	0.02	6.76	3-18	8.46	0.32	5.07
10-25	8.19	0.03	6.70	1-8	8.43	0.15	7.55	3-23	8.46	0.20	7.22
10-30	8.19	0.23	7.26	1-13	8.46	0.15	7.96	3-28	8.46	0.30	6.48
11-4	8.49	0.15	6.23	1-18	8.46	0.16	7.58	4-2	8.46	0.18	16.16
11-9	8.49	0.18	7.21	1-23	8.46	0.14	6.21	4-7	8.46	0.08	4.46
11-14	8.49	0.01	4.81	1-28	8.46	0.17	7.17	4-12	8.46	0.02	7.40
11-19	8.49	0.01	6.82	2-2	8.46	0.18	6.12	4-17	8.46	0.13	7.46
11-24	8.49	0.05	6.82	2-7	9.44	0.23	9.05	4-22	8.46	0.20	9.06
11-29	8.49	0.58	5.28	2-12	9.44	0.33	7.61	4-27	8.46	0.31	6.44
12-4	8.43	0.22	5.90	2-17	9.44	0.31	6.21	5-2	8.46	1.56	6.82
12-9	8.43	0.16	7.90	2-22	9.44	0.01	10.20	5-7	8.46	0.11	5.58

The age given is the initial age at start of study. Dates given are first days of five-day balance periods. Italic figures were omitted from calculations of averages given in Volume I.

TABLE 146

Donald  
100 months

## PEDOMETER MEASUREMENTS

Date	Miles	Date	Miles	Date	Miles	Date	Miles	Date	Miles
11-16	1 $\frac{3}{8}$	12-22	$\frac{7}{8}$	1-25	$\frac{3}{8}$	3-8	1	4-12	1 $\frac{1}{2}$
11-17	1 $\frac{1}{8}$	12-28	$\frac{3}{4}$	1-26	$\frac{3}{8}$	3-14	1 $\frac{3}{4}$	4-18	$\frac{1}{8}$
11-30	2	12-29	$\frac{5}{8}$	2-1	$\frac{1}{2}$	3-21	1 $\frac{1}{2}$	4-19	$\frac{1}{4}$
12-1	2 $\frac{3}{8}$	1-4	$\frac{7}{16}$	2-2	$\frac{1}{2}$	3-22	1 $\frac{1}{2}$	4-25	$\frac{1}{2}$
12-7	$\frac{1}{2}$	1-5	$\frac{1}{4}$	2-8	$\frac{5}{8}$	3-28	1 $\frac{3}{4}$	4-26	1 $\frac{3}{4}$
12-8	2 $\frac{1}{8}$	1-11	2 $\frac{1}{8}$	2-9	1 $\frac{1}{4}$	3-29	1 $\frac{5}{8}$	5-2	1 $\frac{1}{4}$
12-14	1 $\frac{1}{2}$	1-12	1 $\frac{5}{8}$	2-15	1	4-4	2 $\frac{1}{4}$	5-3	$\frac{1}{2}$
12-15	1 $\frac{1}{8}$	1-18	1 $\frac{3}{16}$	2-16	1 $\frac{3}{16}$	4-5	$\frac{3}{4}$	5-9	1 $\frac{1}{2}$
12-21	1 $\frac{1}{8}$	1-19	1 $\frac{1}{8}$	2-29	$\frac{5}{8}$	4-11	1 $\frac{1}{2}$	5-10	$\frac{7}{8}$
				3-7	2 $\frac{3}{16}$				

New Haven pedometers were set at 27 inches and worn hooked to belt during hours awake.

TABLE 147

Donald  
105 months

## TEMPERATURE AND PULSE

Date	Temper- ature	Pulse	Date	Temper- ature	Pulse	Date	Temper- ature	Pulse
4-7	98.2	72	4-19	98.4	84	5-2	98.2	76
4-8	98.2	72	4-20	99.6	79	5-3	98.2	88
4-9	98.2	73	4-21	98.1	72	5-4	98.2	84
4-10	98.2	75	4-22	98.0	77	5-5	98.6	72
4-11	98.2	70	4-23	99.8	84	5-6	98.4	80
4-12	98.2	86	4-24	98.0	72	5-7	98.0	82
			4-25	98.2	76			
4-13	98.8	84	4-26	98.2	80	5-8	98.4	71
4-14	98.4	88	4-27	98.2	76	5-9	98.3	76
4-15	98.8	88	4-28	98.4	80	5-10	98.2	76
4-16	98.2	77	4-29	98.3	76	5-11	98.4	80
4-17	98.7	72	4-30	97.8	76	5-12	98.0	80
4-18	100.0	88	5-1	98.0	84	5-13	98.0	80





DONALD

FIGURE 90. Actual size reproduction of roentgenogram of left hand.  
Chronological age 98 months.



DONALD

FIGURE 91. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 98 months.



DONALD

FIGURE 92. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 98 months.





DONALD

FIGURE 93. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 98 months.



DONALD

FIGURE 94. Actual size reproduction of roentgenogram of left hip.  
Chronological age 98 months.



DONALD

FIGURE 95. Actual size reproduction of roentgenogram of left knee.  
Chronological age 98 months.





DONALD

FIGURE 96. Actual size reproduction of roentgenogram of left knee.  
Chronological age 98 months.



DONALD

FIGURE 97. Actual size reproduction of roentgenogram of left foot.  
Chronological age 98 months.



DONALD

FIGURE 98. Actual size reproduction of roentgenogram of left foot.  
Chronological age 98 months.



TABLE 148

Donald  
104 months

## NITROGEN PARTITION OF URINE

*Value in grams of nitrogen per day*

Date	Total nitrogen	Urea	Ammonia	Creatinine + Creatine	Creatinine	Uric acid
3-28	11.30	10.280	0.220	0.425	0.262	0.149
3-29	11.56	10.449	0.271	0.452	0.266	0.146
3-30	10.78	9.566	0.254	0.460	0.248	0.121
3-31	10.20	9.237	0.263	0.472	0.231	0.111
4-1	11.32	9.968	0.312	0.466	0.250	0.110
4-2	10.08	8.727	0.273	0.434	0.221	0.119
4-3	10.17	8.732	0.228	0.394	0.253	0.138
4-4	10.77	9.416	0.244	0.442	0.254	0.127
4-5	10.60	9.142	0.258	0.434	0.257	0.150
4-6	10.30	9.130	0.250	0.465	0.255	0.123
4-7	10.90	9.804	0.256	0.412	0.236	0.124
4-8	9.81	8.818	0.222	0.433	0.238	0.081
4-9	9.95	8.979	0.221	0.448	0.221	0.128
4-10	10.46	9.202	0.258	0.470	0.261	0.132
4-11	10.83	8.743	0.237	0.490	0.244	0.128
4-12	11.46	8.265	0.195	0.483	0.288	0.145
4-13	11.46	10.090	0.310	0.505	0.259	0.129
4-14	10.92	9.214	0.266	0.493	0.266	0.142
4-15	9.53	8.407	0.293	0.400	0.233	0.114
4-16	10.51	9.363	0.279	0.378	0.290	0.148
4-17	11.18	10.262	0.234	0.454	0.268	0.163
4-18	11.49	10.344	0.360	0.405	0.298	0.119
4-19	11.14	10.031	0.271	0.409	0.275	0.137
4-20	10.88	9.837	0.263	0.414	0.270	0.121
4-21	10.77	9.735	0.235	0.364	0.234	0.140
4-22	11.03	9.868	0.222	0.354	0.238	0.155
4-23	11.07	9.904	0.246	0.424	0.290	0.153
4-24	11.57	10.139	0.225	0.411	0.286	0.160
4-25	10.57	9.443	0.287	0.384	0.257	0.139
4-26	9.98	8.975	0.237	0.375	0.253	0.137
4-27	10.07	9.008	0.216	0.343	0.218	0.118
4-28	10.73	9.434	0.310	0.403	0.273	0.076
4-29	10.02	8.794	0.202	0.372	0.246	0.136
4-30	10.37	9.101	0.223	0.438	0.266	0.142
5-1	10.00	8.852	0.226	0.428	0.266	0.134
5-2	10.57	9.269	0.219	0.383	0.290	0.147
5-3	10.93	9.420	0.252	0.388	0.254	0.147
5-4	10.66	9.119	0.243	0.426	0.264	0.129
5-5	10.46	9.080	0.244	0.418	0.260	0.143
5-6	10.82	9.690	0.289	0.441	0.252	0.130
5-7	10.33	8.917	0.243	0.401	0.257	0.133
5-8	9.87	8.749	0.219	0.451	0.312	0.142
5-9	10.49	9.303	0.283	0.369	0.285	0.130
5-10	10.81	9.587	0.229	0.466	0.290	0.137
5-11	10.23	9.572	0.306	0.353	0.277	0.085

The age given is the initial age at start of study.



DONALD

FIGURE 99. Actual size reproduction of roentgenogram of left hand.  
Chronological age 104 months.



DONALD

FIGURE 100. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 104 months.



DONALD

FIGURE 101. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 104 months.





DONALD

FIGURE 102. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 104 months.



DONALD

FIGURE 103. Actual size reproduction of roentgenogram of left hip.  
Chronological age 104 months.



DONALD

FIGURE 104. Actual size reproduction of roentgenogram of left knee.  
Chronological age 104 months.



DONALD

FIGURE 105. Actual size reproduction of roentgenogram of left knee.  
Chronological age 104 months.





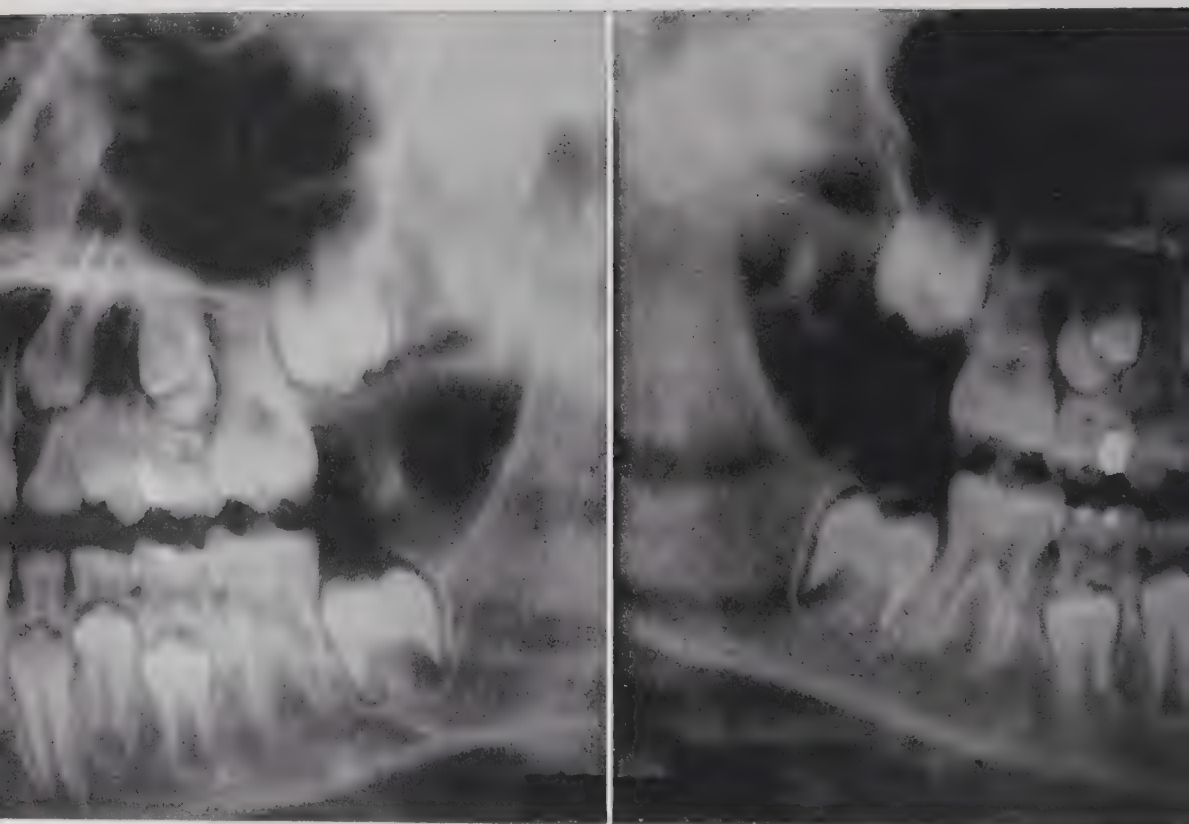
DONALD

FIGURE 106. Actual size reproduction of roentgenogram of left foot.  
Chronological age 104 months.



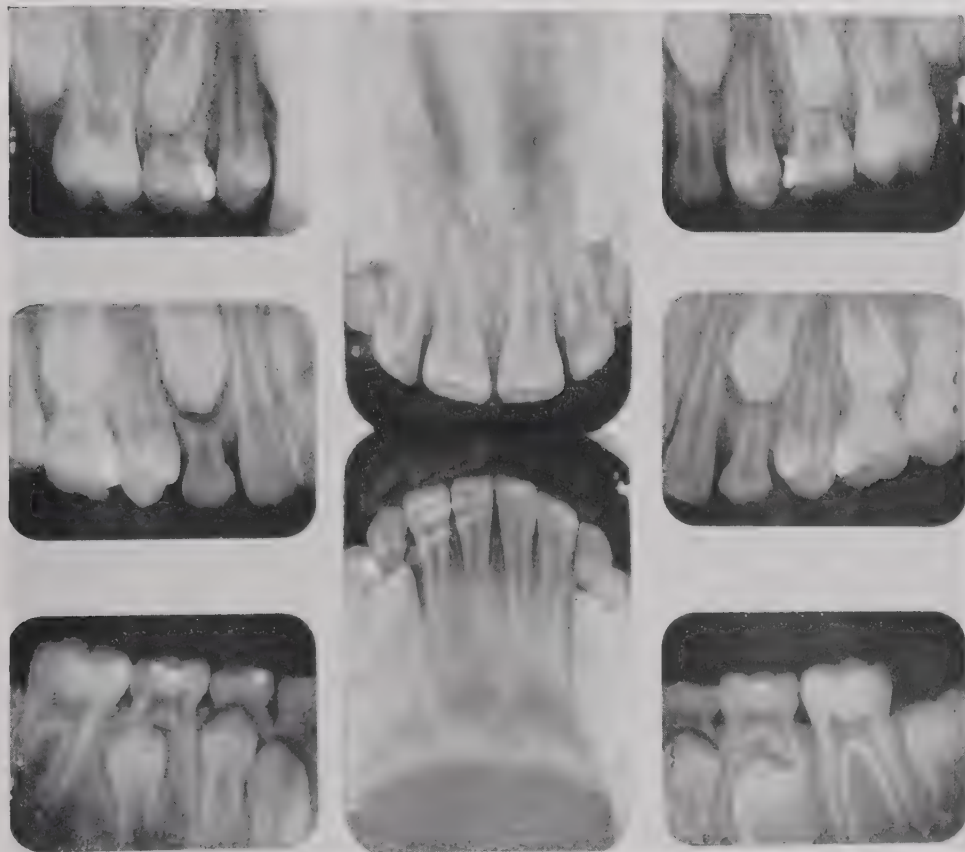
DONALD

FIGURE 107. Actual size reproduction of roentgenogram of left foot.  
Chronological age 104 months.



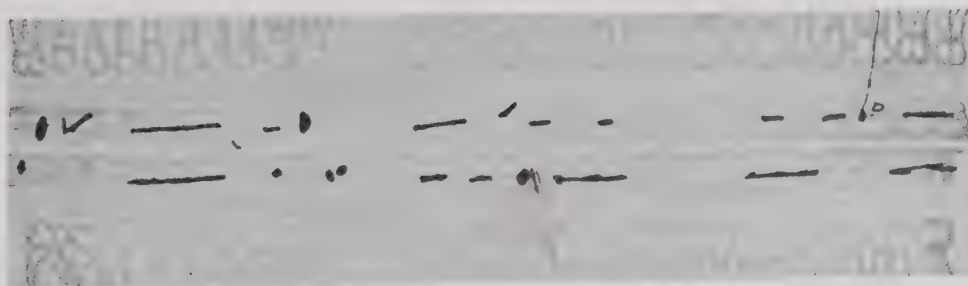
DONALD

FIGURE 108. Actual size reproduction of roentgenogram of jaws.  
Chronological age 106 months.



DONALD

FIGURE 109. Roentgenograms of teeth, age 106 months.



DONALD

FIGURE 110. Dental examination, age 106 months.





DONALD

FIGURE 111. Actual size reproduction of roentgenogram of left hand.  
Chronological age 106 months.



DONALD

FIGURE 112. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 106 months.



DONALD

FIGURE 113. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 106 months.



DONALD

FIGURE 114. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 106 months.





DONALD

FIGURE 115. Actual size reproduction of roentgenogram of left hip.  
Chronological age 106 months.



DONALD

FIGURE 116. Actual size reproduction of roentgenogram of left knee.  
Chronological age 106 months.



DONALD

FIGURE 117. Actual size reproduction of roentgenogram of left knee.  
Chronological age 106 months.



DONALD

FIGURE 118. Actual size reproduction of roentgenogram of left foot.  
Chronological age 106 months.





DONALD

FIGURE 119. Actual size reproduction of roentgenogram of left foot.  
Chronological age 106 months.

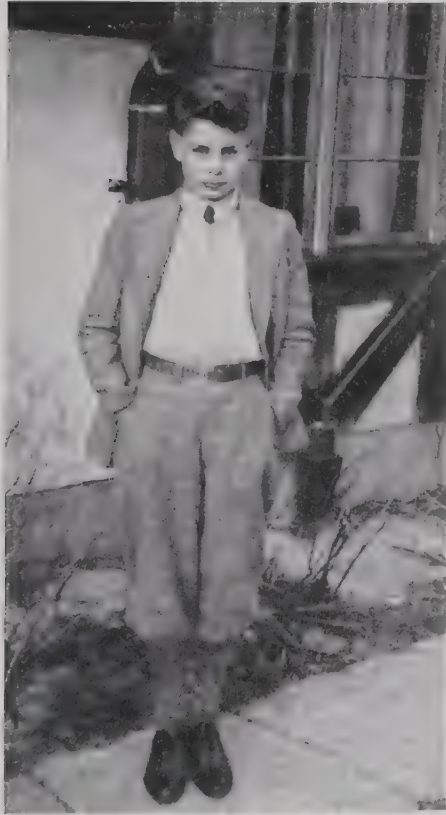


FIGURE 120. DONALD, age 135 months

## ROENTGENOGRAMS OF PROGRESS OF B

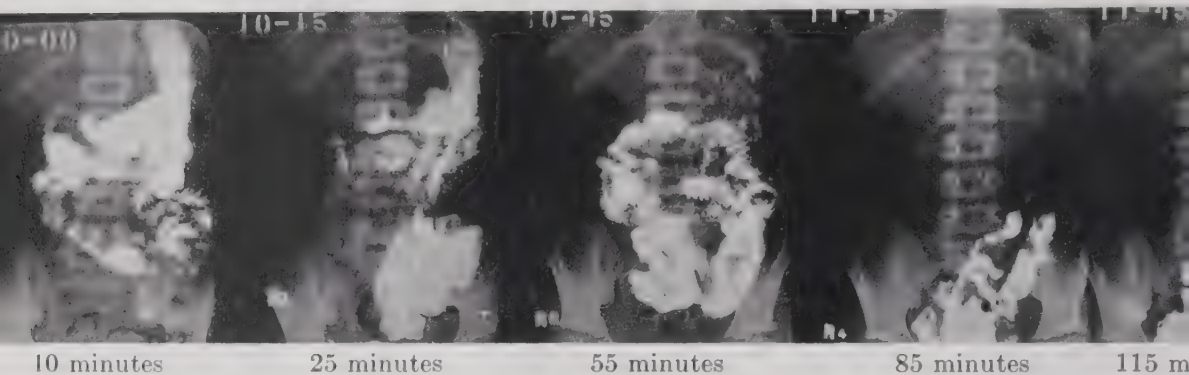


FIGURE 121. Progress of meal consisting of 2 ounces of barium sulfate and 4 ounces of water. The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

DONALD  
Age, 115 months

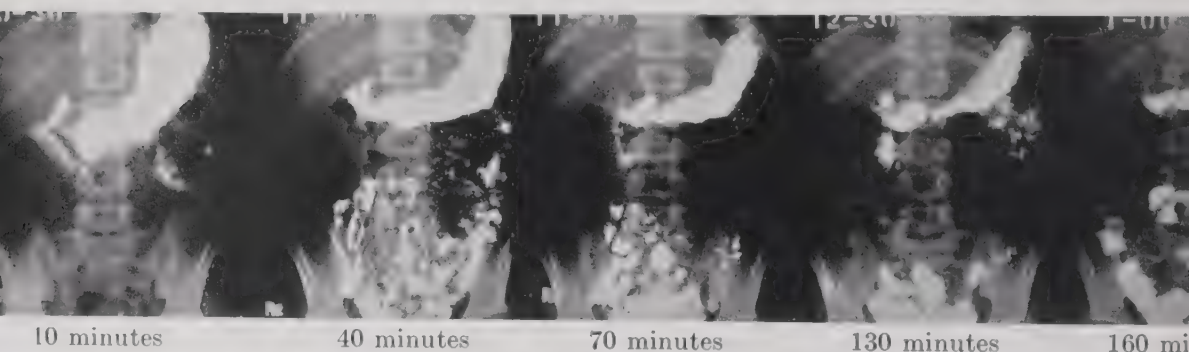


FIGURE 122. Progress of meal consisting of 2 ounces of barium sulfate and 4 ounces of standard pasteurized milk (3.5 per cent fat). The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

DONALD  
Age, 115 months

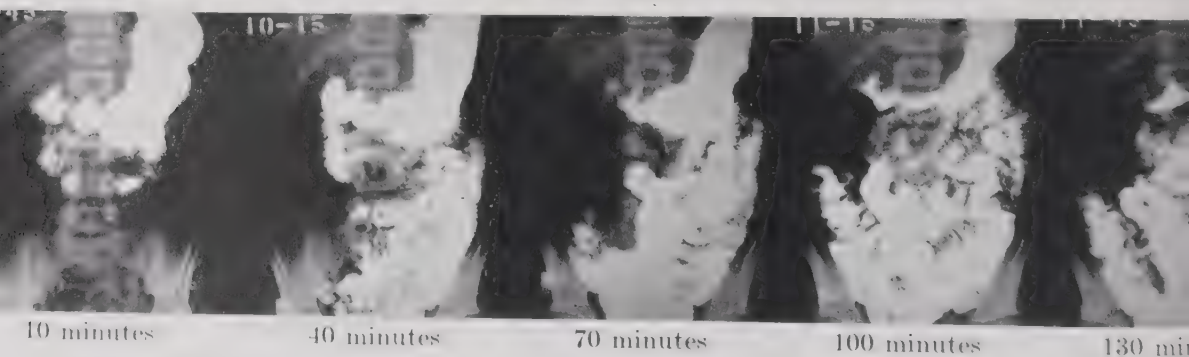
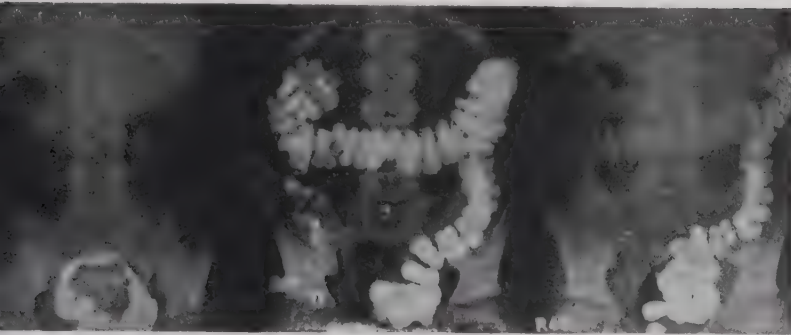


FIGURE 123. Progress of meal consisting of 2 ounces of barium sulfate, 3 ounces of water and 1 ounce of corn syrup (approximately 30 per cent glucose, 61 per cent carbohydrate). The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

DONALD  
Age, 115 months

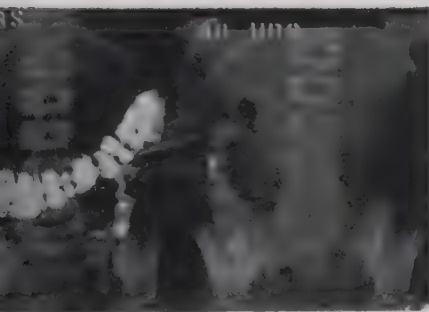
LS THROUGH GASTROINTESTINAL TRACT



145 minutes

24 hours

48 hours



24 hours

48 hours



minutes

200 minutes

24 hours

48 hours



## ROENTGENOGRAMS OF PROGRESS OF BA

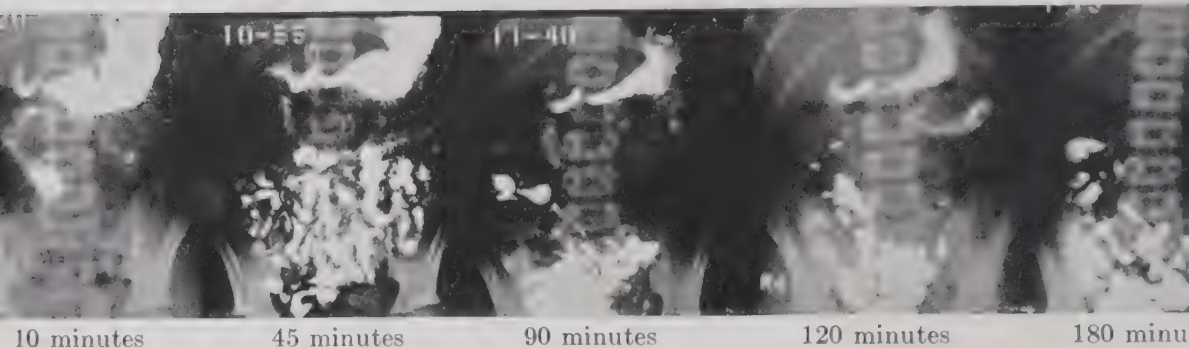


FIGURE 124. Progress of meal consisting of 2 ounces of barium sulfate and 4 ounces of cream (20 per cent fat). The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

DONALD  
Age, 115 months

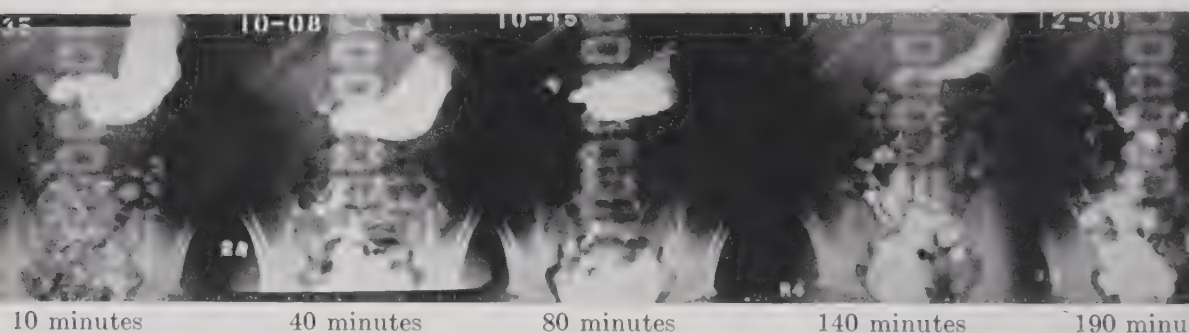


FIGURE 125. Progress of meal consisting of 40 grams of barium sulfate mixed with 100 grams of raw, ground lean meat, baked twenty to thirty minutes and ingested with 200 ml. of water. In the 290 gm. of barium, meat and water ingested (about 50 gm. of water were lost in cooking) the concentrations of fat and protein were approximately 3.5 and 7 per cent, respectively.

DONALD  
Age, 115 months

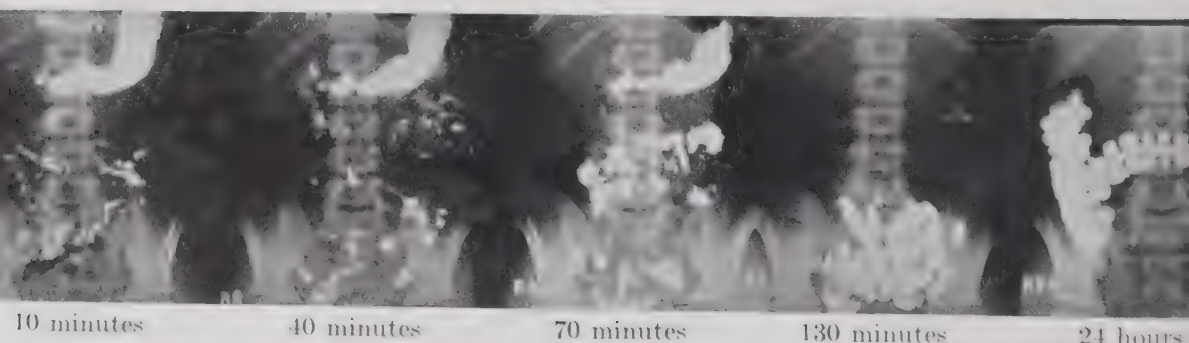
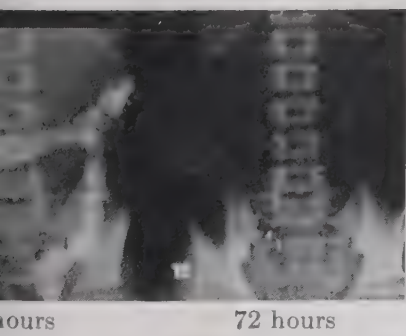
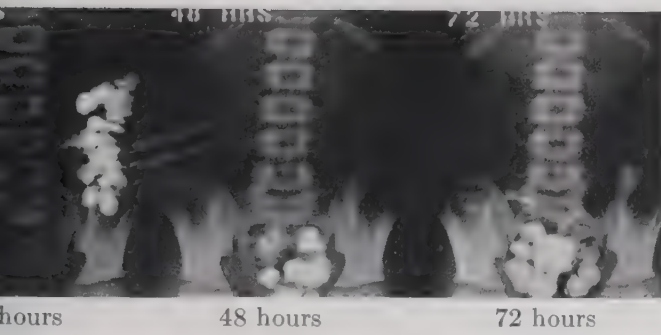
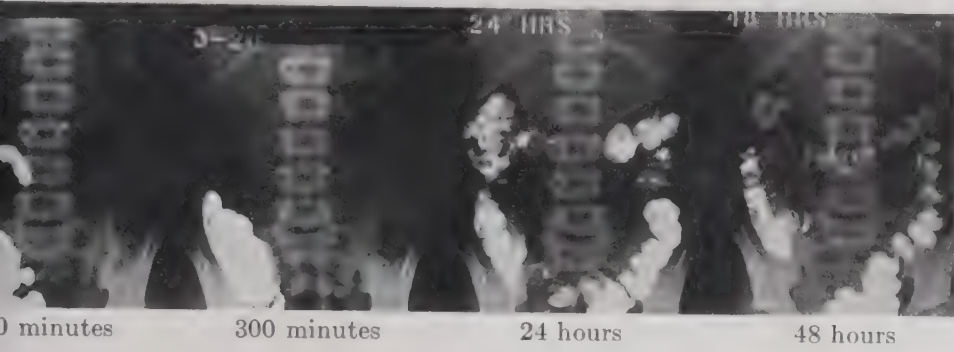


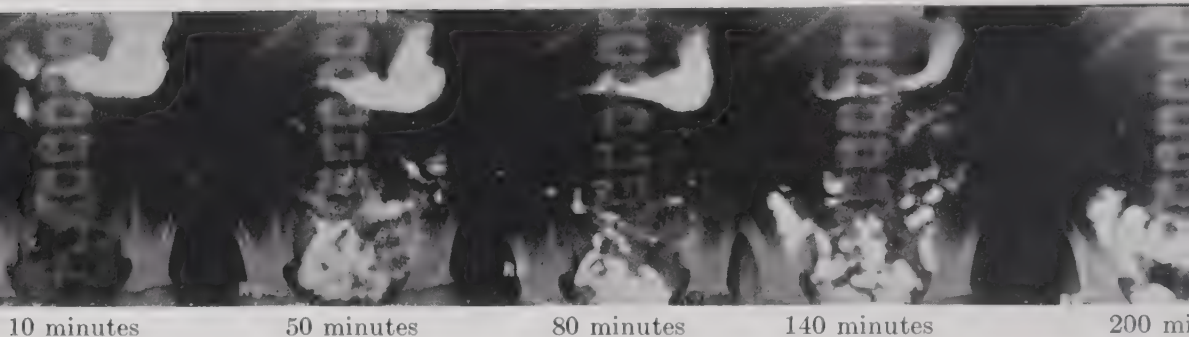
FIGURE 126. Progress of meal consisting of 2 ounces of barium sulfate, 4 ounces of standard pasteurized milk and 0.2-0.3 gm. carmine. The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

DONALD  
Age, 135 months

LS THROUGH GASTROINTESTINAL TRACT



## ROENTGENOGRAMS OF PROGRESS OF BA



10 minutes

50 minutes

80 minutes

140 minutes

200 minutes

FIGURE 127. Progress of meal consisting of 2 ounces of barium sulfate and 4 ounces of evaporated milk, diluted 1:1 with water. The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

DONALD

Age, 135 months



10 minutes

35 minutes

80 minutes

110 minutes

170 minutes

FIGURE 128. Progress of meal consisting of 2 ounces of barium sulfate and 4 ounces of standard pasteurized milk (3.5 per cent fat). The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

DONALD

Age, 135 months



10 minutes

30 minutes

60 minutes

120 minutes

180 minutes

FIGURE 129. Progress of meal consisting of 2 ounces of barium sulfate and 4 ounces of base-exchanged milk. The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

DONALD

Age, 135 months









DONALD

FIGURE 130. Actual size reproduction of roentgenogram of left hand.  
Chronological age 120 months.



DONALD

FIGURE 131. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 120 months.



DONALD

FIGURE 132. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 120 months.



DONALD

FIGURE 133. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 120 months.





DONALD

FIGURE 134. Actual size reproduction of roentgenogram of left hip.  
Chronological age 120 months.



DONALD

FIGURE 135. Actual size reproduction of roentgenogram of left knee.  
Chronological age 120 months.



DONALD

FIGURE 136. Actual size reproduction of roentgenogram of left knee.  
Chronological age 120 months.



DONALD

FIGURE 137. Actual size reproduction of roentgenogram of left foot.  
Chronological age 120 months.





DONALD

FIGURE 138. Actual size reproduction of roentgenogram of left foot.  
Chronological age 120 months.

TABLE 149

Donald  
146 months

COMPLEX CARBOHYDRATES IN INTAKE AND FECES  
*Values in grams per day*

Date	LIGNIN		CELLULOSE		HEMICELLULOSE		
	Intake	Feces	Intake	Feces	INTAKE		Feces
					Total	Stable	
9-18	1.26	1.53	2.88	0.36	2.87	1.65	0.65
9-23	1.26	1.58	2.88	0.52	2.87	1.65	0.71
9-28	1.26	1.20	2.88	0.66	2.87	1.65	0.63
10-3	1.26	1.37	2.88	0.53	2.87	1.65	0.53
10-8	1.26	1.33	2.88	0.56	2.87	1.65	0.65
10-13	1.26	1.49	2.88	0.52	2.87	1.65	0.59
10-18	1.26	1.10	2.88	0.57	2.87	1.65	0.49
10-23	1.26	1.53	2.88	0.68	2.87	1.65	0.62
10-28	1.26	1.88	2.88	0.64	2.87	1.65	0.58
11-2	1.26	1.46	2.88	0.57	2.87	1.65	0.58
11-7	1.26	1.16	2.88	0.57	2.87	1.65	0.54

TABLE 150

Donald  
146 months

BODY LENGTH AND WEIGHT — INTAKE AND ELIMINATION

Date	Recum- bent length*	Weight*	INTAKE			AVERAGE DAILY HEAT OF COMBUSTION			FECES				
			AVERAGE DAILY						AVERAGE DAILY			Lax- ation rate†	Elim- ination time‡
			Dry wt.*	Total water†	Fat	In- take	Urine	Feces	Wet wt.	Dry wt.*	Fat		
mo.day	cm.	kg.	gm.	gm.	gm.	Cal.	Cal.	Cal.	gm.	gm.	gm.		hours
9-18	158.4	41.76	451	1780	108.6	2401	111	104	60.2	20.6	3.6	0.8	75
9-23	158.6	41.28	448	1754	110.6	2395	97	108	75.8	21.4	3.4	0.6	61
9-28	158.8	41.66	489	1706	118.2	2599	99	116	80.2	22.6	4.1	1 0	27
10-3	159.0	41.71	453	1803	113.4	2422	101	104	73.0	20.7	3.5	0.6	73
10-8	159.2	41.73	474	1800	114.2	2507	93	110	75.8	21.6	3.4	0.8	29
10-13	159.2	41.77	454	1752	113.0	2436	100	120	78.0	23.5	4.2	1.0	52
10-18	159.3	41.85	515	1691	114.3	2680	97	98	69.8	18.9	3.8	0.8	50
10-23	159.3	42.24	505	1702	113.1	2641	100	118	92.0	23.5	4.2	0.6	51
10-28	159.3	42.05	471	1698	110.5	2472	99	108	84.8	21.6	3.7	0.8	49
11-2	159.4	42.02	452	1741	112.8	2436	99	120	80.0	23.1	4.0	0.6	50
11-7	159.4	42.20	473	1763	112.2	2506	97	112	79.0	22.4	4.2	1.2	31

The age given is the initial age at start of study. Dates given are first days of five-day balance periods.  
\* See Table 132 for actual values and method of smoothing.  
† Based on vacuum-dried food and cryochem-dried feces. Corresponding values for alcohol-dried food and oven-dried feces are given in Table 597, page 1421.  
‡ Drinking water plus water in food.  
§ Average number of defecations per day.  
§ Elapsed time between ingestion and defecation of marker used to separate feces of 5-day periods.

TABLE 151

Donald  
146 months

POSITIVE MINERALS IN INTAKE, URINE, FECES  
*Values are averages per day*

Date	CALCIUM			MAGNESIUM			SODIUM			POTASSIUM		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo day	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
9-18	933	181	542	297	107	173	3048	2757	10	3491	2995	230
9-23	966	184	563	312	98	182	2982	2428	17	3405	2879	269
9-28	919	162	691	290	100	190	3069	2490	18	3411	2910	294
10-3	949	160	607	318	80	164	3059	2416	19	3487	2204	235
10-8	912	154	608	295	46	170	2966	2644	19	3487	2730	257
10-13	945	130	668	318	99	193	3068	2330	16	3503	2919	251
10-18	938	152	573	307	98	165	3018	2506	23	3501	2894	227
10-23	949	159	703	306	95	212	2990	2578	28	3528	3215	330
10-28	937	154	572	294	86	168	3024	2521	33	3465	2970	244
11-2	966	157	687	297	110	190	2996	2466	20	3512	3009	312
11-7	1000	158	584	309	110	148	2925	2624	12	3567	2932	242

The age given is the initial age at start of study. Dates given are first days of five-day balance periods.

TABLE 152

Donald  
146 months

NITROGEN AND NEGATIVE MINERALS IN INTAKE, URINE, FECES  
*Values are averages per day*

Date	NITROGEN			PHOSPHORUS			CHLORINE			SULFUR		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo day	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
9-18	12.90	11.13	1.27	1474	990	418	4423	4348	11	1010	763	125
9-23	12.68	11.14	1.45	1492	998	407	4345	3558	26	959	802	140
9-28	13.26	10.93	1.53	1469	992	408	4396	3846	26	1037	742	147
10-3	13.75	11.33	1.40	1525	1005	369	4332	3577	21	991	780	132
10-8	13.07	10.74	1.50	1466	971	366	4161	3946	22	1058	740	139
10-13	13.39	10.86	1.68	1529	969	426	4290	3482	24	894	732	147
10-18	13.26	10.96	1.21	1529	952	352	4491	3816	29	1032	749	117
10-23	13.66	11.39	1.55	1531	953	456	4434	3968	40	1084	747	145
10-28	13.35	11.06	1.30	1450	988	356	4295	3814	33	950	776	130
11-2	13.47	11.19	1.47	1487	968	439	4446	3632	28	970	780	149
11-7	13.21	10.75	1.41	1559	940	353	4335	4080	22	1009	747	136

The age given is the initial age at start of study. Dates given are first days of five-day balance periods.

TABLE 153

Donald  
146 months

FAT PARTITION OF FECES  
*Values in grams per day*

Date	Unsaponi- fiable	Neutral fat	Free fatty acids	Soap
9-18	1.15	0.19	0.27	1.95
9-23	1.10	0.20	0.31	1.77
9-28	1.09	0.20	0.31	2.47
10-3	0.98	0.15	0.27	2.12
10-8	1.07	0.20	0.34	1.85
10-13	1.24	0.21	0.31	2.42
10-18	1.00	0.20	0.27	2.31
10-23	1.18	0.21	0.30	2.47
10-28	1.16	0.22	0.38	1.98
11-2	1.20	0.23	0.35	2.19
11-7	1.30	0.22	0.35	2.32

The age given is the initial age at start of study. Dates given are first days of five-day balance periods.

TABLE 154

Donald  
146 months

IRON, MANGANESE, COPPER, ALUMINUM, LEAD AND TIN  
IN INTAKE, FECES\*  
*Values in milligrams per day*

Date	IRON		MANGANESE		COPPER	
	Intake	Feces	Intake	Feces	Intake	Feces
9-18	11.24	10.61	2.04	2.10	2.79	1.52
9-23	10.59	—	1.87	—	2.37	—
9-28	10.11	—	2.27	—	4.39	—
10-3	12.84	8.42	2.03	2.03	3.80	1.66
10-8	14.35	7.69	2.27	1.91	3.67	1.69
10-13	11.80	9.09	2.16	2.31	3.65	1.90
10-18	12.49	8.85	2.19	1.86	6.26	1.79
10-23	12.79	10.42	2.22	2.20	4.29	2.20
10-28	11.36	8.81	2.18	1.95	4.75	1.83
11-2	10.57	8.88	1.80	1.89	2.53	1.80
11-7	9.34	7.37	1.81	1.74	2.91	1.54

	ALUMINUM		LEAD		TIN	
	Intake	Feces	Intake	Feces	Intake	Feces
9-18	4.55	1.69	0.58	0.30	1.33	1.33
9-23	3.95	—	0.56	—	1.52	—
9-28	3.00	—	0.52	—	1.79	—
10-3	3.53	1.19	0.52	0.27	3.32	1.88
10-8	2.58	1.02	0.62	0.25	1.54	1.84
10-13	2.13	1.49	0.45	0.28	0.92	1.24
10-18	3.66	1.47	0.67	0.23	0.77	0.93
10-23	2.86	2.11	0.62	0.42	0.72	1.01
10-28	3.17	1.88	0.52	0.31	0.70	0.69
11-2	3.40	1.80	0.66	0.40	0.75	0.82
11-7	2.29	1.24	0.52	0.26	0.76	0.74

\* Determined spectrographically by the method of Brody, James K. and Ewing, D. T. Spectrographic determination of some metallic elements in food and feces. Indus. Engin. Chem. (Anal. Ed.) 17:627, 1945.



TITRABLE ACIDITY AND ORGANIC ACID OF URINE  
*Values in milliequivalents per day*

Date	Ti- trable acidity	pH	Total organic acid	Date	Ti- trable acidity	pH	Total organic acid
9-18	22.6	6.27	37.4	10-16	18.4	6.43	37.0
9-19	19.5	6.19	54.9	10-17	14.6	6.90	40.2
9-20	27.0	5.99	37.6	10-18	17.4	6.74	38.6
9-21	25.4	5.94	37.4	10-19	21.4	6.38	36.7
9-22	30.2	5.92	39.0	10-20	16.0	7.10	42.7
9-23	24.1	—	31.0	10-21	18.0	6.50	38.4
9-24	28.5	5.73	34.0	10-22	13.2	6.59	29.2
9-25	23.8	6.10	35.2				
9-26	19.6	6.30	37.8	10-23	12.1	7.08	38.6
9-27	30.4	5.69	33.9	10-24	23.6	6.21	35.9
9-28	16.4	6.10	26.7	10-25	21.8	6.44	40.5
				10-26	5.2	6.88	49.2
9-29	33.6	6.10	47.7	10-27	9.2	6.83	42.3
9-30	23.2	6.10	35.6	10-28	14.1	6.61	39.0
10-1	19.8	6.32	31.5	10-29	18.5	6.38	34.7
10-2	22.5	6.19	34.4	10-30	15.8	6.31	37.3
10-3	23.4	6.20	34.1	10-31	27.0	5.96	35.4
10-4	13.2	7.05	35.4	11-1	22.6	6.32	36.9
10-5	18.7	6.93	36.0	11-2	20.4	6.23	34.4
10-6	12.8	6.80	40.2	11-3	25.0	6.60	36.6
10-7	22.8	6.33	39.7	11-4	22.0	6.28	38.3
10-8	13.4	6.90	47.6				
10-9	8.0	7.11	39.1	11-5	20.6	6.22	37.6
10-10	5.8	7.43	41.2	11-6	25.5	6.04	34.4
10-11	5.2	8.23	43.3	11-7	22.5	6.15	34.8
10-12	17.4	6.98	33.8	11-8	22.4	6.13	34.0
10-13	27.9	6.11	38.8	11-9	17.3	6.36	34.2
10-14	22.0	6.26	36.8	11-10	22.8	6.22	34.6
10-15	26.2	6.18	33.0	11-11	33.2	5.62	32.4

The age given is the initial age at start of study.

TABLE 156

Donald  
146 months

IRON, COPPER, ZINC IN INTAKE, URINE, FECES\*  
*Values are averages per day*

Date	IRON			COPPER			ZINC		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
9-18	9.92	0.10	9.60	4.60	0.43	1.45	14.76	0.45	12.88
9-23	10.43	0.05	10.57	4.13	0.44	2.38	16.62	0.31	16.43
9-28	12.35	0.03	10.99	5.59	0.32	1.67	16.28	0.57	17.55
10-3	11.06	0.06	7.71	4.79	0.81	1.65	16.38	0.36	13.07
10-8	16.40	0.13	8.60	4.81	0.36	2.30	15.16	0.52	3.60
10-13	11.10	0.08	7.34	4.72	0.38	2.04	17.18	0.48	4.08
10-18	12.76	0.08	8.24	6.15	0.22	1.66	15.79	0.31	10.80
10-23	14.36	0.05	10.08	6.50	0.45	1.86	17.25	0.49	12.99
10-28	13.20	0.11	8.26	5.31	0.52	2.12	16.28	0.39	11.15
11-2	10.23	0.04	9.74	5.29	0.57	1.67	18.35	0.47	13.70
11-7	8.50	0.10	—	5.00	0.46	—	15.20	0.48	—

The age given is the initial age at start of study. Dates given are first days of five-day balance periods. Italic figures were omitted from calculations of averages given in Volume I.

\* Determined polarographically.

TABLE 157

Donald  
146 months

## VOLUME, WEIGHT AND SULFUR PARTITION OF URINE

*Values are averages per day*

Date	Volume	Specific gravity	Wet weight	Dry weight*	SULFUR PARTITION		
					Inorganic	Ethereal	Neutral
mo.-day	ml.		gm.	gm.	mg.	mg.	mg.
9-18†	1061	1.023	1085	47.9	—	—	—
9-23†	806	1.030	830	47.4	—	—	—
9-28†	923	1.026	947	47.1	593	71	78
10-3†	869	1.028	893	47.0	636	65	79
10-8†	921	1.032	951	44.4	590	62	88
10-13†	848	1.026	870	46.2	589	65	78
10-18†	870	1.025	892	45.9	612	65	72
10-23†	1022	1.031	1054	47.7	619	66	62
10-28†	920	1.030	948	48.0	601	74	101
11-2†	932	1.024	954	47.0	608	74	98
11-7†	1123	1.027	1153	47.3	—	—	—
11-7‡	—	—	—	—	540	73	55
11-8‡	—	—	—	—	582	73	67
11-9‡	—	—	—	—	570	67	90
11-10‡	—	—	—	—	622	80	87
11-11‡	—	—	—	—	626	58	124

The age given is the initial age at start of study. Dates given are first days of five-day balance periods.

\* Cryochem dried.

† Determined upon 5-day composites and corrected for precipitate solubility.

‡ Determined upon daily urine collections and corrected for precipitate solubility.

TABLE 158

Donald  
146 months

## MANGANESE IN INTAKE, URINE, FECES

*Values are averages per day*

Date	Intake†	Urine*	Feces†	Date	Intake†	Urine*	Feces†
mo.-day	mg.	mg.	mg.	mo.-day	mg.	mg.	mg.
9-18	2.04	0.005	2.02	10-18	<i>2.41</i>	—	<i>1.93</i>
9-23	1.95	0.000	2.12	10-23	2.30	0.006	2.42
9-28	2.23	0.000	2.31				
10-3	2.05	0.000	2.09	10-28	2.36	0.006	1.99
10-8	2.27	0.004	2.10	11-2	2.06	0.005	2.35
10-13	2.18	0.007	2.45	11-7	<i>2.16</i>	<i>0.005</i>	—

The age given is the initial age at start of study. Dates given are first days of five-day balance periods. *Italic figures were omitted from calculations of averages given in Volume I.*

\* Determined polarographically.

† Determined chemically.

TABLE 158A

Donald  
146 months

CARBON IN INTAKE, URINE, FECES  
*Values in grams per day*

Date	Intake	Urine	Feces	Date	Intake	Urine	Feces
mo.-day							
9-18	215.2	9.2	9.5	10-18	215.2	8.6	8.6
9-23	215.2	8.8	9.8	10-23	215.2	9.5	10.7
9-28	215.2	8.6	10.5				
10-3	215.2	10.0	9.8	10-28	215.2	9.0	9.9
10-8	215.2	8.5	10.0	11-2	215.2	9.5	10.6
10-13	215.2	9.1	10.8	11-7	215.2	8.4	10.5

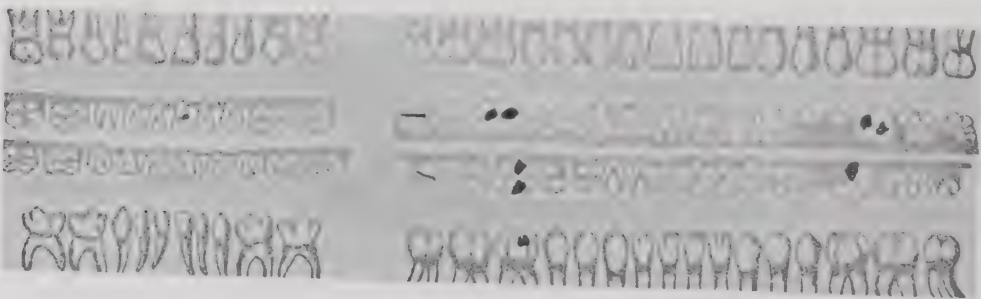
TABLE 160

Donald  
146 months

SALIVA CULTURE ESTIMATION OF CARIES ACTIVITY

Date	QUANTITATIVE*			QUALITATIVE†	COLOR REACTION TEST‡			
	Lacto- bacilli	Cocci	Yeast		hours after preparation			
					24	48	72	96
mo.-day	colonies per ml. of saliva							
9-22	26,000	0	0	+	0	3	4	4
10-11	43,200	0	200	+	3	4	4	4
10-31	40,000	0	0	+	0	4	4	4
11-14	23,600	0	150	+	3	4	4	4

\* 0.2 ml. saliva to tomato agar plate.  
† 1.0 ml. saliva in acid glucose broth.  
‡ 0.2 ml. saliva into melted beef agar



DONALD

FIGURE 139. Dental examination, age 148 months.

## NITROGEN PARTITION OF URINE

*Values in grams of nitrogen per day*

Date	Urine Volume	Total nitrogen	Urea	Am- monia	Creatinine + Creatine	Creatinine	Uric acid
9-18	775	11.280	9.815	0.285	0.417	0.352	0.152
9-19	1240	11.523	9.631	0.314	0.480	0.376	0.161
9-20	1595	11.182	9.617	0.319	0.388	0.360	0.134
9-21	1035	10.847	8.982	0.313	0.472	0.356	0.165
9-22	658	10.772	9.060	0.300	0.420	0.366	0.162
9-23	728	11.354	9.526	0.284	0.451	0.365	0.166
9-24	915	10.987	9.169	0.287	0.433	0.331	0.157
9-25	842	11.345	9.248	0.234	0.422	0.350	0.185
9-26	880	11.717	9.012	0.294	0.475	0.366	0.187
9-27	665	10.502	9.089	0.291	0.387	0.348	0.191
9-28	536	7.740	6.727	0.203	0.276	0.241	0.177
9-29	1275	14.973	12.545	0.430	0.528	0.488	0.183
9-30	1120	11.281	9.416	0.300	0.411	0.364	0.144
10-1	1010	10.330	8.643	0.314	0.432	0.343	0.125
10-2	675	10.224	8.359	0.261	0.422	0.352	0.136
10-3	1015	11.018	9.675	0.270	0.425	0.335	0.131
10-4	915	11.287	9.628	0.452	0.461	0.368	0.141
10-5	820	11.696	10.001	0.537	0.431	0.329	0.155
10-6	870	11.729	9.840	0.478	0.420	0.368	0.141
10-7	727	11.117	9.515	0.365	0.437	0.397	0.133
10-8	637	9.829	8.315	0.375	0.397	0.338	0.134
10-9	775	11.121	9.040	0.915	0.437	0.346	0.140
10-10	1180	11.186	9.228	0.698	0.425	0.180	0.155
10-11	1105	11.004	8.740	1.116	0.425	0.309	0.154
10-12	910	10.848	9.121	0.527	0.425	0.323	0.135
10-13	835	11.671	9.934	0.351	0.452	0.372	0.139
10-14	700	10.702	9.287	0.293	0.394	0.324	0.133
10-15	685	10.222	8.564	0.316	0.392	0.338	0.133
10-16	890	10.716	9.044	0.400	0.376	0.343	0.135
10-17	1130	10.752	9.250	0.340	0.344	0.346	0.155
10-18	910	10.307	8.798	0.387	0.364	0.298	0.154
10-19	760	11.302	9.741	0.429	0.408	0.338	0.141
10-20	850	10.908	9.251	0.389	0.422	0.350	0.135
10-21	825	11.143	9.508	0.425	0.442	0.352	0.126
10-22	1005	10.860	8.983	0.401	0.411	0.357	0.151
10-23	1010	10.930	9.048	0.576	0.425	0.359	0.130
10-24	1010	11.185	9.665	0.235	0.441	0.370	0.151
10-25	895	11.737	10.406	0.448	0.420	0.339	0.150
10-26	1025	11.778	9.669	0.819	0.467	0.364	0.146
10-27	1170	11.439	9.607	0.403	0.455	0.358	0.149
10-28	795	10.686	8.981	0.499	0.451	0.359	0.153
10-29	720	10.850	9.228	0.502	0.413	0.359	0.136
10-30	920	11.220	9.724	0.374	0.404	0.356	0.143
10-31	1125	11.474	9.936	0.312	0.419	0.333	0.155
11-1	1040	11.050	9.448	0.276	0.440	0.334	0.158
11-2	1160	11.164	9.583	0.301	0.471	0.336	0.137
11-3	1085	12.028	10.223	0.320	0.486	0.370	0.146
11-4	875	11.321	9.484	0.295	0.461	0.389	0.127
11-5	703	10.900	9.362	0.258	0.408	0.368	0.148
11-6	835	10.815	9.131	0.296	0.402	0.372	0.146
11-7	1265	10.185	8.822	0.298	0.370	0.359	0.152
11-8	1192	10.410	8.966	0.288	0.393	0.369	0.151
11-9	1220	10.389	8.894	0.481	0.434	0.361	0.143
11-10	1075	11.092	9.534	0.281	0.460	0.358	0.153
11-11	862	11.262	9.878	0.275	0.478	0.368	0.140

The age given is the initial age at start of study. Urine volumes are in milliliters.





FIGURE 140. DONALD, age 146 months.



DONALD

FIGURE 141. Actual size reproduction of roentgenogram of left hand.  
Chronological age 146 months.



DONALD

FIGURE 142. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 146 months.



DONALD

FIGURE 143. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 146 months.





DONALD

FIGURE 144. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 146 months.



DONALD

FIGURE 145. Actual size reproduction of roentgenogram of left hip.  
Chronological age, 146 months.



DONALD

FIGURE 146. Actual size reproduction of roentgenogram of left knee.  
Chronological age 146 months



DONALD

FIGURE 147. Actual size reproduction of roentgenogram of left knee.  
Chronological age 146 months.





DONALD

FIGURE 148. Actual size reproduction of roentgenogram of left foot,  
Chronological age, 146 months.



DONALD

FIGURE 149. Actual size reproduction of roentgenogram of left foot.  
Chronological age 146 months.



FIGURE 150. DONALD. Actual size reproduction of roentgenogram of left hand.  
Chronological age 183 months.

## HERBERT AND JIMMY

Both of the parents of Herbert and Jimmy were born in Indiana. The father completed the tenth grade before going to work in a factory and prior to the depression had an income of about \$200 per month. The mother completed high school, married at the age of seventeen and bore two children before her divorce and remarriage three years later. Five children were born of her second marriage, at approximately two-year intervals. Throughout these years the mother had been well and healthy but shortly after the seventh child was born she developed gallstones. Two years later she died one month following an operation.

During the following year the father kept the children together aided by a fourteen-year-old stepdaughter. He had accumulated debts during his wife's illness and was working nights. Under these conditions the living standards in the home were depressed and when the stepdaughter contracted pneumonia other plans for the care of the children were made.

### HERBERT

#### Medical History

Herbert was born in a hospital October 6, 1928. The mother's pregnancy and delivery were normal. The infant weighed 8 pounds at birth and was breast-fed for six months.

At the age of 80 months Herbert was placed in the care of the Village. Pediatric examination at that time was negative except for enlarged tonsils. The only illness recorded in his medical history was measles. Schick, Dick, Pirquet and Wassermann tests were negative. Herbert was 84 months old when he joined the group of children participating in the second study of nutrition and chemical growth in childhood.

During the eight months of the study, periodic pediatric examinations of Herbert were negative. December 5, he went to bed early with a headache and temperature of 101°. The following day he remained in bed but by evening felt well and cheerful. Dietary and collections were not interrupted. A slight head cold was noted on December 10 and nose drops were used. Herbert



had a cold accompanied by a slight cough on March 29. On that day he received Creo Terpin in doses of one teaspoonful.

After Study II was discontinued Herbert was inoculated against typhoid fever. The records of his medical examinations contain notations of colds more frequently after the study, up to the time his tonsils were removed. Otherwise, his record has continued to be negative.

### Psychological

In Study II, Herbert was a quiet, likeably boy, usually content to follow the lead of the more aggressive members of the group, including his younger brother, Jimmy. Herbert demonstrated a close paternal tie and looked forward to his father's weekly visits. He was affectionate and amenable, always cooperative in the procedures involved in the studies.

Herbert was given a psychological examination at the age of 86 months. On the Stanford-Binet test his M.A. was 82 months, I.Q. 95; on the Arthur Point Scale, M.A. 84 months, I.Q. 98; and on the Goodenough test, M.A. 78 months, I.Q. 91.

Herbert was very friendly and talked a great deal as he worked, especially with the picture puzzles. He was restless and fidgeted a great deal throughout the examination period. He was inclined to be boastful and frequently asked for praise. He would often comment, "I'm good at that" or "I do them all right." His attention is distracted rather easily. He tends to react quickly and impulsively, is not very capable of judging his own abilities and limitations. He has middle-range average intellectual capacity, and approximately equal ability in dealing with abstract and concrete problems. On the Binet test his basal age was year 6 and he passed some tests through year 8 so that he was fairly consistent in the quality of his responses. In the Arthur Point Scale his memory for things seen tends to be inferior; his best responses were with picture formboards. His drawing of a man showed fairly good comprehension and analysis for a child of his age.

In Study III Herbert was 11 years old. He was congenial and liked by everyone. He was eager to cooperate, since at that time he disliked the boarding home where he lived with his three brothers and sister. In addition, his "girl friend," several years his senior, lived in the Village.

When 138 months old Herbert was tested at another agency. He was given the Revised Stanford-Binet, L Scale, and his I.Q.

was 93. The examiner noted "no bizarre responses and no consistent peculiarity of performance—apparently happy in boarding home."

### Endocrinological

Herbert was 90 months old when classified by the endocrinologist, from the medical history, growth records, basal metabolism, physical examination and the roentgenograms of hip, shoulder, knee, elbow, foot and hand.

Gained 2.0 inches since June 19, a period of 9 months. Normal increment for this time and age is 2.2 inches. Four lower incisors. Upper left central incisors are present. Those are all of the permanent teeth. External genitalia are well developed, but the testicles recede into the inguinal canal. This is especially true of the left. Otherwise presents no gross structural endocrine abnormalities.

#### *Roentgenographic Study for Osseous Development*

Hip: Union of the ischium and pubis, which normally occurs at seven, is being affected.

Shoulder: Union of the head and greater tuberosity of the humerus has occurred. This normally occurs at six.

Wrist: Distal epiphysis of the ulna, which normally appears at six, is not present. The capitate, hamate, triangularis, lunate, trapezium, and scaphoid are present. They show development of approximately five years.

Elbow: Internal condyle of the humerus, which normally occurs at six, is just barely visible. Proximal epiphysis of the radius, which normally appears at five, is present and markedly underdeveloped.

Diagnosis: Delay of at least one to two years in osseous development.

Classification: Partial cryptorchid.

TABLE 161

Herbert

#### HEIGHT AND WEIGHT RECORD\*

Age	Height	Weight	Age	Height	Weight	Age	Height	Weight
months	inches	pounds	months	inches	pounds	months	inches	pounds
80	45 $\frac{1}{2}$	45 $\frac{1}{4}$	117	53 $\frac{3}{4}$	69 $\frac{1}{4}$	142	58 $\frac{1}{4}$	80
86	47 $\frac{1}{4}$	49	127	56	74	150	59 $\frac{3}{4}$	97
100	50 $\frac{1}{2}$	59 $\frac{1}{2}$	141	58	82 $\frac{3}{4}$	159	62 $\frac{3}{4}$	112
105	51	59	142	58 $\frac{1}{4}$	79 $\frac{1}{4}$	165	64 $\frac{3}{4}$	121 $\frac{1}{2}$

\* Clinical. See also table of recumbent lengths and weights.

## RECUMBENT LENGTH AND WEIGHT

Age	RECUMBENT LENGTH		Weight	Age	RECUMBENT LENGTH		Weight
	Total	Stem			Total	Stem	
mo.-days	cm.	cm.	kg.	mo.-days	cm.	cm.	kg.
81-5	114.9	—	20.30	89-16	121.3	66.7	21.55
83-11	117.5	—	21.54	89-21	—	—	21.25
84-2	—	—	20.55	89-23	121.9	67.3	—
84-5	—	—	20.30				
84-9	—	—	20.40	89-27	121.3	66.0	21.50
				90-2	—	—	21.50
84-12	120.0	66.0	—	90-3	121.9	67.0	—
84-16	—	—	20.21	90-7	—	—	21.60
84-23	—	—	20.12	90-8	121.9	66.7	—
84-26	—	—	20.41	90-11	—	—	21.70
85-0	—	—	20.54	90-14	121.9	67.2	—
85-2	120.0	66.0	—	90-16	—	—	21.80
85-7	—	—	20.87	90-21	121.3	66.0	—
85-10	—	—	20.75	90-23	—	—	22.20
85-15	119.4	66.0	—	90-26	122.2	66.7	22.46
85-17	—	—	20.85	91-1	122.1	66.8	22.70
				91-7	—	—	22.30
85-22	—	—	20.98	91-9	121.9	66.7	—
85-27	—	—	21.00				
86-0	—	—	21.10	92-8	122.8	66.0	24.18
86-5	119.9	65.4	—	93-10	123.0	66.7	23.98
86-7	—	—	21.26	95-12	125.3	67.9	24.40
86-12	—	—	21.29	96-11	125.4	66.7	24.58
				97-15	126.8	68.2	25.42
86-13	119.7	65.4	—	98-13	127.0	67.8	25.43
86-18	—	—	21.45	102-3	129.7	68.7	26.56
86-22	—	—	21.40				
86-25	—	—	21.45	105-3	130.2	69.2	26.88
86-27	121.0	66.2	—	119-23	137.2	73.2	32.43
87-1	—	—	21.31	131-12	—	—	33.77
87-8	—	—	21.37	131-17	—	—	33.33
				131-22	—	—	33.43
87-10	120.6	66.0	—	131-27	144.8	75.6	33.29
87-13	—	—	21.39	132-0	144.8	76.0	—
87-17	—	—	21.35				
87-20	—	—	21.37	132-2	145.0	76.8	33.48
87-25	121.3	67.0	—	132-4	145.0	75.9	—
87-27	—	—	21.30	132-6	145.2	77.6	—
88-2	—	—	21.17	132-8	—	—	33.46
				132-13	—	—	33.70
88-7	—	—	21.18	132-18	—	—	33.92
88-9	121.0	66.7	—	132-23	—	—	33.77
88-13	—	—	21.10				
88-15	—	—	21.19	132-29	—	—	33.95
88-22	—	—	21.35	133-2	145.8	77.4	33.98
88-26	—	—	21.35	133-4	145.6	77.3	—
89-0	—	—	21.40	133-5	145.2	77.1	—
89-3	121.3	66.7	—	133-7	145.5	77.2	—
89-6	—	—	21.55	133-8	145.0	76.6	—
89-11	—	—	21.65	133-9	—	—	34.04
89-12	121.0	66.7	—	168-11	168.8	86.2	57.95
				189-19	171.0	90.2	64.64

Actual values are averages of independent measurements by two workers. In calculating the smooth values given with the balance data the actual values given above were smoothed by three-point averaging and the resulting figures entered for their respective balance periods. Values for balance periods intervening between measurements were obtained by interpolation.

TABLE 163

Herbert

## ANTHROPOMETRIC MEASUREMENTS

*Values in centimeters*

Age*	BREADTH			LENGTH		WIDTH	
	Biacro-mial	Intertro- chanteric	Inter- crystal	Tibia	Head	Chest	Head
85	22.0	19.3	18.6	25.7	17.6	19.2	14.5
86	22.5	19.3	18.5	25.8	17.5	18.6	14.5
87	23.5	19.2	18.5	25.6	17.5	19.0	14.6
88	23.0	19.4	18.7	27.3	17.6	18.8	14.6
89	22.7	19.6	18.4	26.2	17.4	18.5	14.5
90	23.1	19.6	19.0	26.8	17.7	19.3	14.7
91	23.8	20.0	18.5	26.7	17.5	19.1	14.6
92	24.8	20.3	18.9	26.8	17.5	19.7	14.7
93	24.2	19.8	18.7	27.2	17.6	19.5	14.7
95	24.5	19.8	18.8	27.3	17.5	19.6	14.8
96	24.6	20.5	18.9	27.8	17.6	19.8	14.8
97	24.2	20.5	19.4	28.0	17.5	19.6	14.8
98	24.4	20.5	19.2	27.8	17.7	19.0	14.8
102	24.6	21.0	19.0	28.7	17.5	19.8	14.7
105	24.7	21.0	19.5	29.7	17.7	20.2	14.8
120	26.4	—	20.8	32.0	17.9	22.0	15.0
131	26.7	—	21.5	33.2	18.0	22.0	15.2
132	27.0	—	21.6	33.7	18.0	22.0	15.0
133	27.0	—	21.3	34.0	18.1	22.0	15.1
168	37.2	29.3	27.0	38.8	18.6	26.1	15.2
190	39.7	31.2	28.9	49.2	18.7	27.0	15.8

Age*	DEPTH	CIRCUMFERENCES				
	Chest	Head	Chest	Thigh	Abdomen	Upper arm
85	15.0	50.6	56	30	51	15.2
86	14.0	50.5	56	32	51	15.6
87	14.5	50.8	56	32	53	15.8
88	14.0	50.6	57	31	52	15.5
89	14.3	51.0	55	31	52	16.2
90	15.1	50.8	56	32	53	16.0
91	14.2	51.1	59	32	53	16.2
92	15.0	51.0	59	34	56	16.5
93	14.7	51.4	60	34	55	16.4
95	15.2	51.0	60	33	56	16.1
96	14.6	51.0	59	33	56	16.2
97	15.0	51.5	61	35	58	17.0
98	15.0	51.0	60	35	57	17.0
102	14.5	51.0	61	35	55	16.4
105	15.0	51.5	63	35	59	17.5
120	17.0	52.0	66	38	62	18.0
131	17.0	52.5	68	40	60	19.0
132	16.0	52.3	67	40	59	18.5
133	17.2	52.5	67	39	58	18.5
168	21.1	55.1	78	48	78	24.5
190	20.0	55.5	80	51	72	27.1

\* Months.



## MEASUREMENTS OF THE BONES OF THE WRIST

AGE, months	81	83	89	91	105	131	168	190
<b>CARPALS</b>								
AREA, sq. mm.								
Hamate	68	71	78	80	98	141	228	272
Capitate	117	117	130	133	167	232	346	488
Lesser Multangular		1	4	8	32	78	136	204
Greater Multangular	4	5	9	10	33	78	199	202
Navicular	5	10	14	18	40	84	233	295
Lunate	16	17	23	26	42	82	170	198
Triangular	35	40	40	44	59	95	169	194
Pisiform						10	108	130
<b>GREATEST DIAMETER, mm.</b>								
Hamate	11	11	12	12	14	16	22	23
Capitate	15	15	16	16	18	21	27	28
Lesser Multangular		1	3	4	7	11	13	13
Greater Multangular	2	3	4	4	7	11	17	18
Navicular	3	4	5	6	8	12	24	27
Lunate	5	6	6	7	8	13	19	20
Triangular	8	8	9	9	11	14	18	19
Pisiform						5	13	15
Epiphyses								
1st Metacarpal	6	7	8	8	9	10	16	16
2nd Metacarpal	8	10	10	10	10	11	16	16
3rd Metacarpal	8	10	10	10	10	11	17	17
4th Metacarpal	7	8	8	8	8	9	14	14
<b>ULNA</b>								
DIAMETER, mm.								
Distal epiphysis					4	13	21	18
Distal metaphysis	13	13	13	13	15	17	21	19
<b>RADIUS</b>								
DIAMETER, mm.								
Distal epiphysis	18	18	19	19	20	24	34	35
WRIST AREA,* sq. mm.	906	1026	1045	1056	1173	1431	1917	2135

\* Measured with the planimeter, using Flory's landmarks (Monographs of the Society for Research in Child Development, Vol. I, No. 3, 1936).

TABLE 165

Herbert

## SKELETAL MATURATION

Values in months

Chrono- logical age	HAND				FOOT	ELBOW	KNEE	HIP	SHOULDER	AVERAGE
	B.B.G.*	Flory†	Kelly‡	Todd§	Todd§	Todd§	Todd§	Todd§	Todd§	Todd§
81	70	51	<72	78	79	81	79	75	74	78
83	77	46	77	82	83	83	83	78	77	81
89	81	54	83	86	86	86	87	82	80	84
91	84	60	87	86	87	87	90	85	82	86
105	104	79	91	91	105	101	105	105	87	99
131	131	102	114	129	131	135	129	189	131	131
168	>204	141	179	177	—	—	—	—	—	—
190	>204	154	193	204	—	—	—	—	—	—

\* Baldwin, B. T., Busby, L. M., Garside, H. V. Anatomic growth of children. University of Iowa Studies in Child Welfare, vol. 4, no. 1, 1928. (No standards over 204 months.)

† Flory, C. D. Osseous development in the hand as an index of skeletal development. Monographs of the Society for Research in Child Development, vol. 1, no. 3, 1936.

‡ Kelly, H. J. Anatomic age and its relation to stature. University of Iowa Studies in Child Welfare, vol. 12, no. 5, 1937. (No standards less than 72 months.)

§ Determined by T. Wingate Todd, C. C. Francis and S. Idell Pyle, Western Reserve University, Cleveland.

TABLE 166

Herbert

## BLOOD DETERMINATIONS

Age	Date	Red cells	Hemo-globin	WHITE BLOOD CELLS					
				Total	Poly-morpho-nuclears	Lym-pho-cytes	Mono-cytes	Eosino-philés	
months	mo.-day	millions	gm./100 cc.	per c. mm.	per cent	per cent	per cent	per cent	
81	7-11	5.16	12†	9650	55	35	6	1	
89	3-16	5.20	13†	8750	33	51	12	3	
91	5-14	4.67	13†	9800	47	40	8	4	
*91	5-14	4.71	13†	—	—	—	—	—	
105	7-8	4.79	11†	10400	27	65	6	2	
*131	9-12	4.69	14‡	4600§	39	44	16	1	
		RED BLOOD CELL MEASUREMENTS							
		Hematocrit		Volume	Weight	Diameter	Thickness		
		per cent		c.µ	µµg.	µ	µ		
91	5-14	42		89	97	7.2	2.2		
131	9-12	43		91	—	7.3	2.2		
MINERALS (mg. per 100 ml.)									
SERUM						ERYTHROCYTES			
		Cal-cium	Phos-phorus	So-dium	Potas-sium	Chlor-ine	So-dium	Potas-sium	Chlor-ine
91	5-14	9.9	6.56	299	14.9	344	48	459	205
131	9-12	13.0	6.72	323	22.0	360	33	392	197
PLASMA NITROGEN AND LIPID (mg. per 100 ml.)									
		Nitro-gen	Total lipid	Phos-pholipid	Neutral fat	CHOLESTEROL			
						Total	Free	Esters	
91	5-14	1157	462	158	70	152	34	200	
ERYTHROCYTE NITROGEN AND LIPID (mg. per 100 gm.)									
91	5-14	4587	435	256	78	101	99	3	
91	5-14	Red blood cells total solids: 32.6 per cent by weight. Specific gravity: whole blood, 1.05; plasma, 1.02; red cells, 1.09.							

\* Venous blood.

† Haden-Hauser hemoglobinometer.

‡ Evelyn photoelectric colorimeter.

§ Heparin added.

TABLE 167

Herbert

## BASAL METABOLISM MEASUREMENTS

Age	Date	Sur- face area*	Respi- ration	Pulse rate	Body temper- ature	Blood pres- sure	Basal metab- olism
months	mo.-day	sq.m.	per min.	per min.	°F	S/D†	Cal./24 hr.
84	10-3	0.821	22	—	—	—	1015
84	10-18	0.832	21	—	—	—	977
85	11-7	0.836	23	78	98.6	89/61	955
85	11-20	0.837	39	70	98.7	88/70	919
86	12-10	0.846	31	84	99.4	102/68	979
86	12-18	0.846	25	88	99.5	102/70	1034
87	1-1	0.856	17	82	98.6	104/69	1085
87	1-14	0.852	15	84	99.4	104/67	1142
88	1-29	0.855	16	80	99.2	100/68	1116
88	2-12	0.850	17	80	99.1	96/69	1080
89	3-7	0.858	17	80	98.4	94/82	977
89	3-16	0.857	19	80	99.0	86/70	1061
89	3-20	0.859	22	88	98.7	94/64	1027
90	3-27	0.861	16	84	98.6	92/70	989
90	3-31	0.858	16	84	98.6	98/78	965
90	4-6	0.861	15	78	99.2	102/78	984
90	4-11	0.863	14	84	99.3	100/70	1032
90	4-17	0.866	16	88	98.6	102/72	994
91	4-24	0.868	17	84	99.2	95/70	998
91	4-29	0.879	18	90	99.0	100/70	958
91	5-4	0.883	17	84	98.9	102/76	1109
91	5-12	0.875	14	87	99.2	100/68	1034
131	9-19	1.18	16	75	98.5	96/56	1402
131	9-20	1.18	20	68	98.6	92/60	1364
133	11-2	1.20	17	76	99.1	98/58	1357
133	11-3	1.20	20	72	98.8	100/60	1379

\* DuBois formula.  
† Systolic/Diastolic.

TABLE 168

Herbert

90 months

## TEMPERATURE AND PULSE

Date	Temper- ature	Pulse	Date	Temper- ature	Pulse	Date	Temper- ature	Pulse
4-7	98.2	88	4-20	99.0	85	5-2	99.0	88
4-8	98.3	84	4-21	99.6	85	5-3	99.0	92
4-9	99.1	84	4-22	98.6	88	5-4	98.9	83
4-10	99.0	84	4-23	98.6	87	5-5	98.6	92
4-11	99.3	84	4-24	99.2	84	5-6	99.4	88
4-12	98.4	83	4-25	98.7	92	5-7	98.4	94
4-13	100.0	92	4-26	99.0	96	5-8	99.0	84
4-14	98.6	88	4-27	98.6	90	5-9	98.8	88
4-15	100.0	92	4-28	99.0	100	5-10	98.8	88
4-16	98.3	91	4-29	98.6	92	5-11	98.8	88
4-17	98.6	88	4-30	99.0	86	5-12	99.2	87
4-18	99.8	96	5-1	98.6	88	5-13	98.6	88
4-19	98.6	88						



HERBERT

FIGURE 151. Actual size reproduction of roentgenogram of left hand.  
Chronological age 81 months.





HERBERT

FIGURE 152. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 81 months.



## HERBERT

FIGURE 153. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 81 months.



## HERBERT

FIGURE 154. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 81 months.



HERBERT

FIGURE 155. Actual size reproduction of roentgenogram of left hip.  
Chronological age 81 months.





HERBERT

FIGURE 156. Actual size reproduction of roentgenogram of left knee.  
Chronological age 81 months.



HERBERT

FIGURE 157. Actual size reproduction of roentgenogram of left knee.  
Chronological age 81 months.



HERBERT

FIGURE 158. Actual size reproduction of roentgenogram of left foot.  
Chronological age 81 months.



HERBERT

FIGURE 159. Actual size reproduction of roentgenogram of left foot.  
Chronological age 81 months.





## HERBERT

FIGURE 160. Actual size reproduction of roentgenogram of left hand.  
Chronological age 83 months.



## HERBERT

FIGURE 161. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 83 months.



HERBERT

FIGURE 162. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 83 months.



## HERBERT

FIGURE 163. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 83 months.





HERBERT

FIGURE 164. Actual size reproduction of roentgenogram of left hip.  
Chronological age 83 months.



HERBERT

FIGURE 165. Actual size reproduction of roentgenogram of left knee.  
Chronological age 83 months.



HERBERT

FIGURE 166. Actual size reproduction of roentgenogram of left knee.  
Chronological age 83 months.



HERBERT

FIGURE 167. Actual size reproduction of roentgenogram of left foot.  
Chronological age 83 months.





HERBERT

FIGURE 168. Actual size reproduction of roentgenogram of left foot.  
Chronological age 83 months.

TABLE 169

Herbert  
84 monthsFOOD INTAKE  
*Values in grams per day*

Food	DATE							
	9-30 to 10-30	10-30 to 12-4	12-4 to 1-13	1-13 to 2-7	2-7 to 3-3	3-3 to 3-18	3-18 to 3-23*	3-23 to 5-12†
Apple	100	100	100	100	100	100	100	100
Ascorbic acid	—	—	—	.02	.02	—	—	—
Banana	100	100	200	200	200	200	200	100
Beef, lean	100	100	100	100	100	100	100	100
Bread, white	20	70	70	70	70	70	70	70
Bread, whole wheat	30	30	30	30	30	30	30	30
Butter	20	30	30	30	36	35	38	48
Cabbage	25	25	25	25	25	25	25	25
Carrot	25	25	25	25	25	25	25	25
Cheese, American	15	15	15	15	15	15	15	15
Corn flakes	15	15	15	15	15	15	15	15
Egg, whole	50	50	50	50	50	50	50	50
Graham cracker	18	18	18	18	18	18	18	18
Lettuce	20	20	20	20	20	20	20	20
Milk, fluid	400	400†	400†	400†	400†	400†	400†	400†
Orange concentrate	50	50	50	50	—	—	—	—
Orange juice, fresh	—	—	—	—	—	50	50	50
Peanut butter	16	16	16	16	16	16	16	16
Potato	40	70	70	70	70	70	70	70
Salt	2	2	2	2	2	2	2	2
Shredded wheat	15	15	15	15	15	15	15	15
Spinach	—	—	—	—	—	100	—	—
Sugar (average)	8	6	8	8	10	11	11	10
Tomato juice	60	60	60	60	60	60	60	60
Water (average)	442	333	398	470	340	393	400	456

\* Oxalic acid, 0.7 gm., and calcium (as acetate) 0.058 gm., additional.

† Irradiated.

‡ Antuitrin S, 3 cc. hypodermically, April 7, 9, 12, 14, 17, 19, 22, 24.

TABLE 170

Herbert  
85 months

## PEDOMETER MEASUREMENTS

Date	Miles	Date	Miles	Date	Miles	Date	Miles	Date	Miles
11-16	$1\frac{1}{8}$	12-21	$2\frac{1}{2}$	1-25	2	3-1	$3\frac{5}{8}$	4-11	$3\frac{1}{4}$
11-17	$2\frac{1}{8}$	12-22	$2\frac{3}{8}$	1-26	2	3-7	3	4-12	4
11-23	$1\frac{1}{8}$	12-28	$2\frac{5}{8}$	2-1	1	3-8	$1\frac{1}{8}$	4-18	1
11-24	$2\frac{5}{8}$	12-29	$1\frac{3}{8}$	2-2	$1\frac{7}{8}$	3-14	$3\frac{1}{8}$	4-19	$2\frac{1}{4}$
11-30	$2\frac{1}{8}$	1-4	$1\frac{3}{8}$	2-8	$2\frac{1}{2}$	3-21	$3\frac{7}{8}$	4-25	$1\frac{3}{4}$
				2-9	$2\frac{1}{2}$				
12-1	$1\frac{1}{8}$	1-5	$2\frac{3}{8}$	2-15	$2\frac{3}{8}$	3-22	$2\frac{3}{4}$	4-26	$4\frac{1}{2}$
12-7	$1\frac{1}{8}$	1-11	$1\frac{3}{4}$	2-16	$1\frac{3}{4}$	3-28	$2\frac{1}{2}$	5-2	4
12-8	$1\frac{1}{8}$	1-12	$2\frac{1}{8}$	2-22	$3\frac{1}{2}$	3-29	$4\frac{1}{8}$	5-3	$1\frac{3}{4}$
12-14	$\frac{7}{8}$	1-18	$1\frac{1}{2}$	2-23	$2\frac{1}{2}$	4-4	$3\frac{3}{8}$	5-9	$3\frac{1}{2}$
12-15	$1\frac{1}{2}$	1-19	$2\frac{1}{2}$	2-29	$1\frac{1}{2}$	4-5	$1\frac{5}{8}$	5-10	$1\frac{1}{2}$

New Haven pedometers were set at 27 inches and worn hooked to belt during hours awake.

## BODY LENGTH AND WEIGHT—INTAKE AND ELIMINATION

Date	Recumbent length*	Weight*	INTAKE			AVERAGE DAILY HEAT OF COMBUSTION			FECES				
			AVERAGE DAILY			In-take	Urine	Feces	AVERAGE DAILY			Lax-ation rate†	Elimination time§
			Dry wt.‡	Total water†	Fat				Wet wt.	Dry wt.‡	Fat		
mo.-day	cm.	kg.	gm.	gm.	gm.	Cal.	Cal.	Cal.	gm.	gm.	gm.		hours
9-30	120	20.52	317	1327	57.5	1635	64	41	45.0	8.0	1.0	1.2	58
10-5	120	20.47	312	1284	57.5	1616	71	50	53.0	13.0	1.3	1.6	59
10-10	120	20.42	317	1256	57.5	1637	69	58	81.8	13.0	1.5	2.0	23
10-15	120	20.30	321	1272	57.5	1650	59	58	57.2	12.0	1.3	1.8	49
10-20	120	20.24	316	1148	57.5	1632	65	56	48.4	13.0	1.4	1.6	48
10-25	120	20.25	314	1247	57.5	1624	65	50	52.8	12.0	1.2	1.8	36
10-30	120	20.36	362	1201	71.0	1889	75	61	57.0	14.0	1.4	1.6	48
11-4	120	20.61	360	1178	71.0	1881	73	63	53.8	15.0	1.6	2.0	48
11-9	120	20.72	360	1179	71.0	1881	69	63	59.0	13.0	1.4	1.4	73
11-14	120	20.82	358	1168	71.0	1872	67	61	76.4	11.0	1.2	1.8	59
11-19	120	20.86	362	1214	71.0	1887	72	65	66.6	15.0	1.7	1.8	55
11-24	120	20.94	360	1206	71.0	1881	70	72	114.8	19.0	1.8	1.8	48
11-29	120	21.03	358	1198	71.0	1873	72	41	50.8	13.0	1.3	1.6	34
12-4	120	21.12	382	1310	74.0	1976	71	94	100.6	17.0	1.8	2.2	31
12-9	120	21.22	383	1284	74.0	1981	75	74	56.0	14.0	1.5	1.4	29
12-14	120	21.33	383	1330	74.0	1978	75	75	86.6	14.0	1.4	2.0	25
12-19	120	21.38	382	1369	74.0	1977	79	76	85.6	17.0	1.7	1.8	23
12-24	120	21.43	392	1294	74.0	2015	68	76	108.0	12.0	1.2	2.8	6
12-29	120	21.39	387	1286	74.0	1996	69	91	161.2	15.0	1.5	4.0	26
1-3	121	21.38	386	1339	74.0	1990	42	82	122.0	17.0	1.7	2.6	11
1-8	121	21.36	387	1462	74.0	1994	66	93	79.0	22.0	2.4	2.0	34
1-13	121	21.37	391	1500	74.0	1987	66	99	79.0	20.0	2.2	2.0	41
1-18	121	21.37	393	1406	74.0	1995	68	89	72.8	20.0	1.9	1.8	7
1-23	121	21.34	389	1352	74.0	1978	68	74	91.0	15.0	1.5	1.6	25
1-28	121	21.28	389	1398	74.0	1983	72	92	85.6	23.0	2.4	1.8	30
2-2	121	21.22	393	1342	74.0	1994	65	77	71.8	12.0	1.2	1.8	34
2-7	121	21.15	376	1192	80.0	1906	76	96	93.4	22.0	2.5	1.8	24
2-12	121	21.16	379	1241	80.0	1919	68	80	72.4	15.0	1.6	1.6	24
2-17	121	21.21	373	1171	80.0	1983	74	76	70.0	13.0	1.6	1.4	48
2-22	121	21.30	376	1327	80.0	1996	68	99	77.6	22.0	2.6	1.8	35
2-27	121	21.37	375	1283	80.0	1994	74	84	83.4	15.0	1.8	1.8	11
3-3	121	21.43	398	1428	82.1	1992	73	84	57.2	20.0	2.0	1.0	47
3-8	121	21.53	402	1407	82.1	2005	75	87	69.8	21.0	2.2	1.4	48
3-13	121	21.58	401	1428	82.1	2003	64	87	86.4	15.0	1.4	1.4	48
3-18	121	21.48	384	1348	82.6	2003	68	61	83.4	19.0	2.0	1.4	24
3-23	122	21.43	366	1276	92.5	2016	75	89	88.2	19.0	3.0	1.8	25
3-28	122	21.42	357	1261	92.5	1978	73	74	72.6	16.0	1.9	1.2	33
4-2	122	21.53	357	1227	92.5	1978	72	83	83.0	16.0	2.1	1.4	24
4-7	122	21.60	354	1200	92.5	1967	60	66	95.0	13.0	1.5	1.0	30
4-12	122	21.70	361	1201	92.5	1995	72	89	61.2	19.0	2.3	1.6	32
4-17	122	21.90	360	1326	92.5	1990	71	88	65.2	19.0	2.4	1.6	35
4-22	122	22.15	361	1321	92.5	1993	67	92	62.2	22.0	2.9	1.0	48
4-27	122	22.45	360	1431	92.5	1990	59	64	73.6	14.0	1.7	1.8	49
5-2	122	22.49	364	1345	92.5	2008	64	81	59.8	19.0	2.7	1.4	58
5-7	122	22.43	364	1781	92.5	2005	70	74	68.0	16.0	2.1	1.6	24

The age given is the initial age at start of study. Dates given are first days of five-day balance periods.  
 \* See Table 162 for actual values and method of smoothing.

† Based on alcohol-dried food and oven-dried feces.

‡ Drinking water plus water in foods.

§ Average number of defecations per day.

§ Elapsed time between ingestion and defecation of marker used to separate feces of five-day periods.

TABLE 172

Herbert  
84 monthsNITROGEN AND NEGATIVE MINERALS IN INTAKE, URINE, FECES  
*Values are averages per day*

Date	NITROGEN			PHOSPHORUS			CHLORINE			SULFUR		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
9-30	9.45	8.74	0.74	996	461	327	3031	2957	5	612	598	51
10-5	9.45	8.83	0.86	996	497	429	3031	2903	8	612	581	64
10-10	9.45	8.51	1.21	996	512	469	3031	2664	20	612	573	81
10-15	9.45	8.64	1.04	996	485	454	3031	3026	00	612	632	80
10-20	9.45	8.73	0.88	996	539	422	3031	2920	00	612	589	67
10-25	9.45	8.19	0.87	996	460	435	3031	2764	00	612	595	51
10-30	10.32	8.78	0.99	1076	512	478	3412	3138	4	692	637	67
11-4	10.32	9.22	0.99	1076	550	521	3412	3276	82	692	634	76
11-9	10.32	9.33	1.37	1076	480	486	3412	3444	37	692	639	66
11-14	10.32	9.06	1.11	1076	456	448	3412	3288	57	692	609	68
11-19	10.32	9.13	1.17	1076	480	404	3412	3345	57	692	719	69
11-24	10.32	9.28	1.31	1076	526	464	3412	3120	110	692	609	63
11-29	10.32	8.85	1.03	1076	449	360	3412	3120	22	692	575	58
12-4	10.43	8.65	1.36	1103	452	489	3524	3245	59	699	583	99
12-9	10.43	8.97	1.29	1103	504	438	3524	3298	39	699	566	70
12-14	10.43	8.62	1.29	1103	506	408	3524	3120	50	699	576	77
12-19	10.43	9.30	1.35	1103	535	389	3524	3245	65	699	612	91
12-24	10.43	8.16	1.39	1103	477	405	3524	3120	101	699	526	94
12-29	10.43	8.58	1.54	1103	451	511	3524	3180	129	699	561	92
1-3	10.43	8.58	1.41	1103	479	468	3524	2940	92	699	564	81
1-8	10.43	8.29	1.27	1103	491	519	3524	3120	89	699	539	96
1-13	10.43	8.64	1.30	1103	510	532	3524	3245	115	699	564	105
1-18	10.43	8.88	1.31	1103	492	524	3524	3245	65	699	590	104
1-23	10.43	8.89	1.34	1103	490	379	3524	3285	39	699	580	80
1-28	10.43	8.84	1.34	1103	492	535	3524	3457	50	699	587	96
2-2	10.43	8.67	1.19	1103	508	448	3524	3240	34	699	593	76
2-7	10.43	9.30	1.36	1100	546	607	3522	3144	128	697	618	99
2-12	10.43	8.57	1.25	1100	493	487	3522	3228	14	697	578	82
2-17	10.43	9.09	1.23	1100	494	437	3522	3198	32	697	607	71
2-22	10.43	8.94	1.41	1100	575	545	3522	3276	33	697	597	92
2-27	10.43	9.18	1.24	1100	576	467	3522	3174	33	697	621	78
3-3	10.79	8.87	1.25	1202	523	525	4067	3821	39	733	631	93
3-8	10.79	9.14	1.31	1202	562	500	4067	3882	76	733	614	92
3-13	10.79	9.07	1.40	1202	580	480	4067	3830	28	733	613	86
3-18	10.50	8.39	1.19	1115	572	446	3530	3295	56	705	589	76
3-23	10.39	8.78	1.27	1088	547	490	3418	3198	28	698	608	84
3-28	10.39	9.10	1.19	1088	594	470	3418	3570	44	698	684	84
4-2	10.39	8.84	1.16	1088	490	509	3418	3240	53	698	552	83
4-7	10.39	8.78	1.27	1088	517	396	3418	3270	71	698	572	65
4-12	10.39	9.07	1.16	1088	543	552	3418	3216	66	698	615	87
4-17	10.39	9.05	1.12	1088	620	580	3418	3201	61	698	602	94
4-22	10.39	7.93	1.09	1088	435	577	3418	3332	68	698	536	103
4-27	10.39	7.44	1.22	1088	428	376	3418	3042	68	698	497	60
5-2	10.39	7.59	1.04	1088	531	402	3418	3276	50	698	514	82
5-7	10.39	8.36	1.11	1088	606	402	3418	3174	32	698	541	74



TABLE 173

Herbert  
84 months

## POSITIVE MINERALS IN INTAKE, URINE, FECES

*Values are averages per day*

Date	CALCIUM			MAGNESIUM			SODIUM			POTASSIUM		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
9-30	722	47	468	248	68	153	1876	1912	13	2252	1843	243
10-5	722	54	538	248	69	165	1876	1927	12	2252	1998	323
10-10	722	55	612	248	65	191	1876	1620	43	2252	1715	473
10-15	722	48	553	248	63	179	1876	2013	13	2252	2028	350
10-20	722	42	505	248	65	164	1876	1862	13	2252	1768	327
10-25	722	45	575	248	63	169	1876	1855	14	2252	1758	347
10-30	767	61	589	266	68	187	2176	1994	12	2440	1965	357
11-4	767	68	593	266	72	178	2176	2040	13	2440	2025	334
11-9	767	68	787	266	65	246	2176	2169	00	2440	1945	500
11-14	767	66	583	266	62	178	2176	2042	39	2440	1872	394
11-19	767	58	586	266	67	177	2176	2072	25	2440	1924	390
11-24	767	65	593	266	67	185	2176	2050	78	2440	2030	505
11-29	767	57	570	266	71	154	2176	1997	00	2440	1581	301
12-4	772	67	561	299	81	197	2180	1994	35	2822	2059	487
12-9	772	44	632	299	82	215	2180	2132	00	2822	2095	481
12-14	772	52	614	299	117	168	2180	1985	29	2822	2205	414
12-19	772	60	628	299	98	187	2180	2168	20	2822	2246	471
12-24	772	61	621	299	105	181	2180	1962	26	2822	2148	493
12-29	772	63	669	299	120	211	2180	2061	92	2822	2102	714
1-3	772	50	607	299	100	185	2180	1872	58	2822	2150	482
1-8	772	37	576	299	92	179	2180	2003	18	2822	2087	410
1-13	772	37	594	299	101	190	2180	1985	25	2822	2207	480
1-18	772	46	597	299	91	186	2180	2087	00	2822	2282	417
1-23	772	36	552	299	94	184	2180	2122	35	2822	2233	494
1-28	772	36	633	299	85	205	2180	2196	27	2822	2274	469
2-2	772	36	581	299	74	185	2180	2105	14	2822	2150	431
2-7	768	38	646	296	78	204	2178	2062	30	2786	2340	494
2-12	768	43	612	296	76	164	2178	2087	00	2786	2056	416
2-17	768	53	605	296	83	153	2178	2020	00	2786	2194	421
2-22	768	45	625	296	73	191	2178	2097	17	2786	2232	464
2-27	768	49	589	296	77	196	2178	2001	33	2786	2057	462
3-3	830	43	611	369	80	220	2549	2374	26	3167	2269	342
3-8	830	52	636	369	88	218	2549	2506	13	3167	2472	388
3-13	830	50	658	369	98	253	2549	2416	24	3167	2548	445
3-18	837	42	661	315	82	180	2172	2371	25	3058	2363	390
3-23	775	48	634	282	80	174	2169	2020	30	2676	1926	436
3-28	775	50	594	282	78	162	2169	2247	28	2676	1967	368
4-2	775	48	607	282	71	165	2169	2036	45	2676	1994	422
4-7	775	61	643	282	82	172	2169	2014	62	2676	1930	453
4-12	775	78	622	282	86	168	2169	1926	00	2676	1967	361
4-17	775	78	609	282	74	157	2169	1970	00	2676	1997	366
4-22	775	63	636	282	70	162	2169	2030	20	2676	1914	354
4-27	775	61	657	282	69	167	2169	1845	22	2676	1749	401
5-2	775	65	557	282	74	152	2169	2004	00	2676	1962	304
5-7	775	56	573	282	83	165	2169	2014	30	2676	1892	347

TABLE 174

Herbert  
90 months

## NITROGEN PARTITION OF URINE

*Values in grams of nitrogen per day*

Date	Total nitrogen	Urea	Ammonia	Creatinine +Creatine	Creatinine	Uric acid
3-28	9.20	8.205	0.235	0.326	0.192	0.112
3-29	9.13	7.692	0.228	0.408	0.229	0.127
3-30	8.87	7.646	0.234	0.390	0.192	0.101
3-31	8.50	7.594	0.206	0.420	0.171	0.109
4-1	9.79	8.664	0.236	0.404	0.193	0.112
4-2	8.64	6.854	0.246	0.368	0.186	0.105
4-3	8.97	7.052	0.208	0.359	0.187	0.115
4-4	8.45	7.085	0.215	0.352	0.185	0.107
4-5	9.34	8.153	0.187	0.404	0.218	0.136
4-6	8.79	7.716	0.204	0.352	0.207	0.114
4-7	9.27	8.327	0.213	0.333	0.180	0.123
4-8	7.94	7.128	0.172	0.327	0.188	0.117
4-9	8.81	7.642	0.178	0.379	0.184	0.113
4-10	9.04	6.469	0.191	0.382	0.201	0.113
4-11	8.86	7.885	0.175	0.395	0.177	0.117
4-12	10.03	8.638	0.212	0.429	0.225	0.140
4-13	8.59	7.546	0.294	0.396	0.192	0.106
4-14	8.86	7.656	0.204	0.366	0.199	0.124
4-15	9.13	7.956	0.264	0.375	0.208	0.127
4-16	8.73	7.730	0.246	0.342	0.184	0.114
4-17	10.02	8.946	0.239	0.427	0.221	0.148
4-18	9.10	8.139	0.253	0.318	0.216	0.121
4-19	8.81	7.824	0.226	0.347	0.199	0.137
4-20	8.59	7.582	0.240	0.335	0.205	0.123
4-21	8.71	7.913	0.221	0.304	0.188	0.129
4-22	8.31	7.577	0.240	0.286	0.189	0.112
4-23	8.04	7.170	0.178	0.330	0.205	0.108
4-24	8.10	7.132	0.172	0.307	0.223	0.119
4-25	7.62	6.759	0.225	0.284	0.203	0.120
4-26	7.58	6.741	0.181	0.275	0.205	0.118
4-27	8.46	7.305	0.197	0.338	0.190	0.102
4-28	7.26	6.300	0.188	0.321	0.214	0.107
4-29	7.26	6.448	0.246	0.295	0.195	0.108
4-30	7.00	6.202	0.208	0.350	0.206	0.104
5-1	7.22	6.550	0.182	0.372	0.216	0.117
5-2	6.95	6.006	0.208	0.321	0.223	0.113
5-3	7.48	6.689	0.217	0.354	0.205	0.118
5-4	7.85	6.684	0.222	0.374	0.207	0.121
5-5	7.85	7.171	0.219	0.373	0.210	0.115
5-6	7.82	6.904	0.198	0.435	0.203	0.117
5-7	7.93	7.135	0.215	0.373	0.206	0.129
5-8	8.07	6.845	0.209	0.435	0.259	0.132
5-9	7.73	6.746	0.200	0.320	0.218	0.094
5-10	9.00	7.810	0.246	0.481	0.244	0.130
5-11	9.09	8.180	0.298	0.353	0.214	0.099

The age given is the initial age at start of study.

TABLE 175

Herbert  
84 months

## COMPLEX CARBOHYDRATES IN INTAKE AND FECES

*Values in grams per day*

Date	LIGNIN		CELLULOSE		HEMICELLULOSE		
	Intake	Feces	Intake	Feces	INTAKE		Feces
					Total	Stable	
9-30	1.28	0.82	2.08	0.31	2.17	1.72	0.57
10-5	1.28	1.21	2.08	0.54	2.17	1.72	0.92
10-10	1.28	1.20	2.08	0.19	2.17	1.72	0.98
10-15	1.28	1.03	2.08	0.44	2.17	1.72	0.67
10-20	1.28	1.31	2.08	0.37	2.17	1.72	0.79
10-25	1.28	1.06	2.08	0.38	2.17	1.72	0.78
10-30	1.33	1.46	2.32	0.33	2.47	1.89	1.01
11-4	1.33	1.45	2.32	0.53	2.47	1.89	0.90
11-9	1.33	1.27	2.32	0.33	2.47	1.89	0.80
11-14	1.33	1.00	2.32	0.44	2.47	1.89	0.56
11-24	1.36	1.42	2.37	0.61	2.65	2.09	1.30
11-29	1.29	1.22	2.27	0.41	2.28	1.68	0.87
12-4	1.79	2.29	2.56	0.72	2.62	2.02	1.08
12-9	1.79	1.83	2.56	0.50	2.62	2.02	0.84
12-14	1.79	1.81	2.56	0.45	2.62	2.02	0.78
12-19	1.79	1.74	2.56	0.69	2.62	2.02	1.20
12-24	1.79	1.33	2.56	0.24	2.62	2.02	0.75
12-29	1.79	1.42	2.56	0.44	2.62	2.02	0.80
1-3	1.79	1.79	2.56	0.51	2.62	2.02	0.98
1-8	1.79	2.38	2.56	0.76	2.62	2.02	1.26
1-13	1.79	2.44	2.56	0.29	2.62	2.02	1.23
1-18	1.76	2.10	2.50	0.55	2.44	1.82	1.20
1-23	1.79	1.54	2.56	0.41	2.62	2.02	0.87
1-28	1.79	2.61	2.56	0.56	2.62	2.02	1.45
2-2	1.79	1.30	2.56	0.44	2.62	2.02	0.73
2-7	1.79	2.53	2.56	0.49	2.62	2.02	1.26
2-12	1.79	1.83	2.56	0.46	2.62	2.02	0.89
2-17	1.79	1.74	2.56	0.40	2.62	2.02	0.85
2-22	1.79	2.46	2.56	0.63	2.62	2.02	1.49
3-3	1.92	2.42	2.84	0.33	2.76	2.12	1.30
3-8	1.92	2.54	2.84	0.43	2.76	2.12	1.39
3-13	1.92	1.75	2.84	0.56	2.76	2.12	0.91
3-18	1.79	1.96	2.56	0.60	2.62	2.02	1.05
3-23	1.33	1.79	2.32	0.44	2.47	1.89	1.21
3-28	1.36	1.20	2.37	0.52	2.65	2.09	1.03
4-2	1.33	1.56	2.32	0.46	2.47	1.89	1.02
4-7	1.33	1.15	2.32	0.55	2.47	1.89	0.81
4-12	1.33	1.84	2.32	0.48	2.47	1.89	1.28
4-22	1.33	2.14	2.32	0.66	2.47	1.89	1.52
4-27	1.33	1.38	2.32	0.53	2.47	1.89	0.76
5-2	1.33	1.78	2.32	0.57	2.47	1.89	1.13
5-7	1.33	1.54	2.32	0.46	2.47	1.89	0.97

TABLE 176

Herbert  
84 months

## IRON IN INTAKE, URINE AND FECES

*Values are averages per day*

Date	Intake	Urine	Feces	Date	Intake	Urine	Feces	Date	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mo.-day	mg.	mg.	mg.	mo.-day	mg.	mg.	mg.
9-30	7.39	0.40	4.37	12-14	8.50	0.08	5.13	2-27	8.46	0.36	5.66
10-5	7.39	0.15	5.75	12-19	8.50	0.03	6.25	3-3	9.48	0.00	8.05
10-10	7.39	0.17	5.14	12-24	8.50	0.23	4.18	3-8	9.48	0.98	9.24
10-15	7.39	—	5.48	12-29	8.50	0.28	4.99	3-13	9.48	0.75	6.02
10-20	7.39	0.05	5.72	1-3	8.50	0.12	5.97	3-18	8.50	0.67	7.27
10-25	7.39	0.18	5.52	1-8	8.50	0.00	7.40	3-23	8.20	0.19	7.48
10-30	8.20	0.19	8.50	1-13	8.50	0.21	7.08	3-28	8.20	0.13	10.24
11-4	8.20	0.22	6.41	1-18	8.50	0.20	7.55	4-2	8.20	0.15	6.30
11-9	8.20	0.11	5.52	1-23	8.50	0.19	5.12	4-7	8.20	0.15	5.17
11-14	8.20	0.32	4.90	1-28	8.50	0.24	8.11	4-12	8.20	0.02	9.78
11-19	8.20	0.05	6.43	2-2	8.50	0.18	4.32	4-17	8.20	0.18	9.26
11-24	8.20	0.52	7.88	2-7	8.46	0.22	8.17	4-22	8.20	0.16	10.04
11-29	8.20	0.30	5.25	2-12	8.46	0.14	5.55	4-27	8.20	0.08	5.48
12-4	8.50	0.05	5.72	2-17	8.46	0.32	4.91	5-2	8.20	0.00	8.15
12-9	8.50	0.13	5.90	2-22	8.46	0.01	7.92	5-7	8.20	0.10	7.36

The age given is the initial age at start of study. Dates given are first days of five-day balance periods. Italic figures were omitted from calculations of averages given in Volume I.





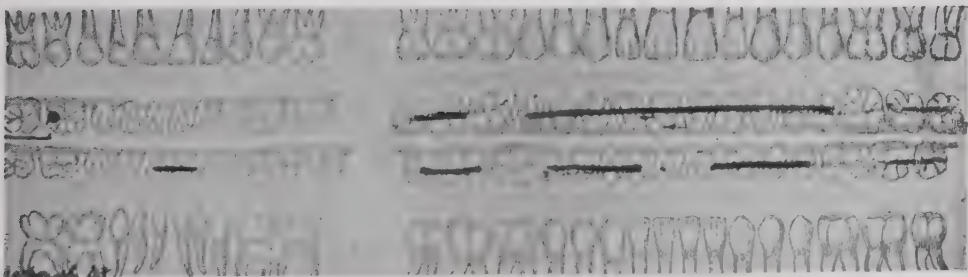
## HERBERT

FIGURE 169. Actual size reproduction of roentgenogram of jaws.  
Chronological age 86 months.



HERBERT

FIGURE 170. Roentgenograms of teeth, age 86 months.



HERBERT

FIGURE 171. Dental examination, age 86 months.



FIGURE 172. HERBERT  
Age 85 months



HERBERT

FIGURE 173. Actual size reproduction of roentgenogram of left hand.  
Chronological age 89 months.





## HERBERT

FIGURE 174. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 89 months.



HERBERT

FIGURE 175. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 89 months.



HERBERT

FIGURE 176. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 89 months.



HERBERT

FIGURE 177. Actual size reproduction of roentgenogram of left hip.  
Chronological age 89 months.





## HERBERT

FIGURE 178. Actual size reproduction of roentgenogram of left knee.  
Chronological age 89 months.



## HERBERT

FIGURE 179. Actual size reproduction of roentgenogram of left knee.  
Chronological age 89 months.



HERBERT

FIGURE 180. Actual size reproduction of roentgenogram of left foot.  
Chronological age 89 months.



HERBERT

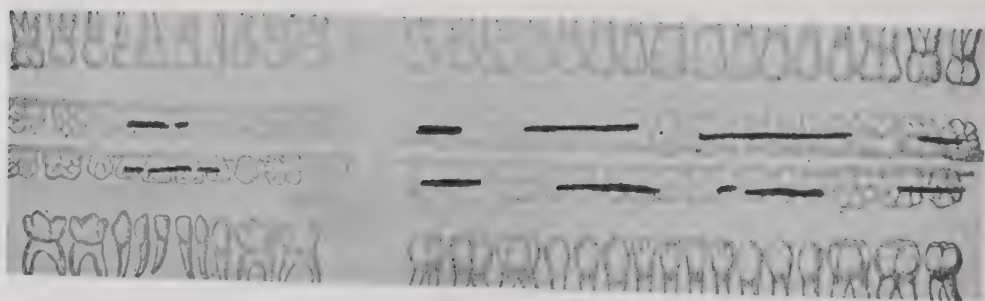
FIGURE 181. Actual size reproduction of roentgenogram of left foot.  
Chronological age 89 months.





HERBERT

FIGURE 182. Roentgenograms of teeth, age 91 months.



HERBERT

FIGURE 183. Dental examination, age 91 months.



## HERBERT

FIGURE 184. Actual size reproduction of roentgenogram of jaws  
Chronological age 91 months.



HERBERT

FIGURE 185. Actual size reproduction of roentgenogram of left hand.  
Chronological age 91 months.



HERBERT

FIGURE 186. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 91 months.





## HERBERT

FIGURE 187. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 91 months.



HERBERT

FIGURE 188. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 91 months.



HERBERT

FIGURE 189. Actual size reproduction of roentgenogram of left hip.  
Chronological age 91 months.



HERBERT

FIGURE 190. Actual size reproduction of roentgenogram of left knee.  
Chronological age 91 months.





HERBERT

FIGURE 191. Actual size reproduction of roentgenogram of left knee.  
Chronological age 91 months.



HERBERT

FIGURE 192. Actual size reproduction of roentgenogram of left foot.  
Chronological age 91 months.



HERBERT

FIGURE 193. Actual size reproduction of roentgenogram of left foot.  
Chronological age 91 months.



## HERBERT

FIGURE 194. Actual size reproduction of roentgenogram of left hand.  
Chronological age 105 months.





HERBERT

FIGURE 195. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 105 months.



## HERBERT

FIGURE 196. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 105 months.



## HERBERT

FIGURE 197. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 105 months.



HERBERT

FIGURE 198. Actual size reproduction of roentgenogram of left hip.  
Chronological age 105 months.





## HERBERT

FIGURE 199. Actual size reproduction of roentgenogram of left knee.  
Chronological age 105 months.



HERBERT

FIGURE 200. Actual size reproduction of roentgenogram of left knee.  
Chronological age 105 months.



HERBERT

FIGURE 201. Actual size reproduction of roentgenogram of left foot.  
Chronological age 105 months.



HERBERT

FIGURE 202. Actual size reproduction of roentgenogram of left foot.  
Chronological age 105 months.



## ROENTGENOGRAMS OF PROGRESS OF BA



FIGURE 203. Progress of meal consisting of 2 ounces of barium sulfate and 4 ounces of water. The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

HERBERT  
Age, 102 months

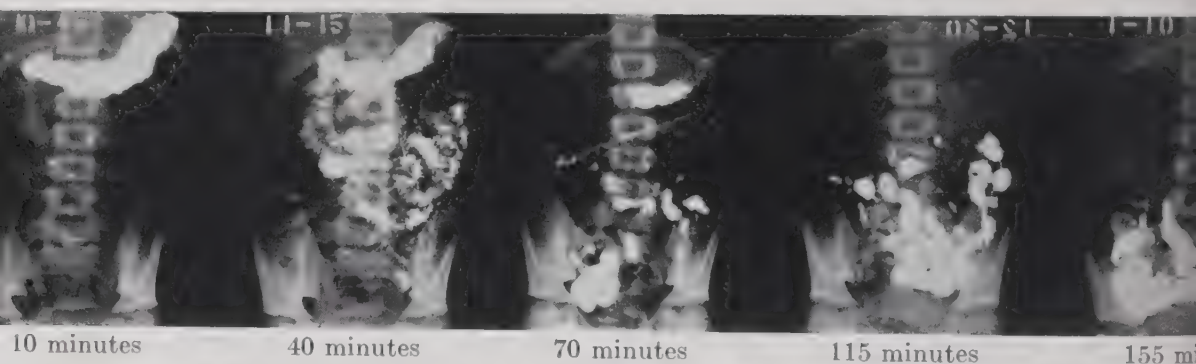


FIGURE 204. Progress of meal consisting of 2 ounces of barium sulfate and 4 ounces of standard pasteurized milk (3.5 per cent fat). The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

HERBERT  
Age, 102 months

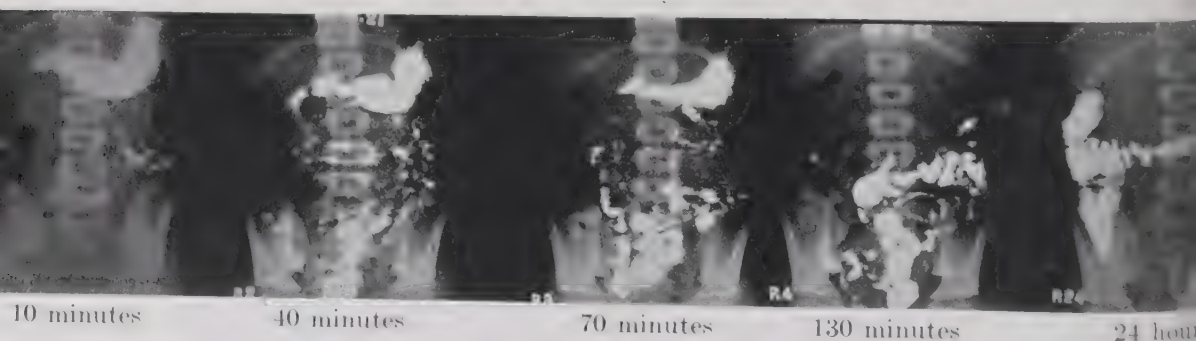
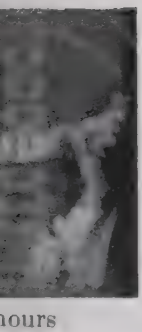
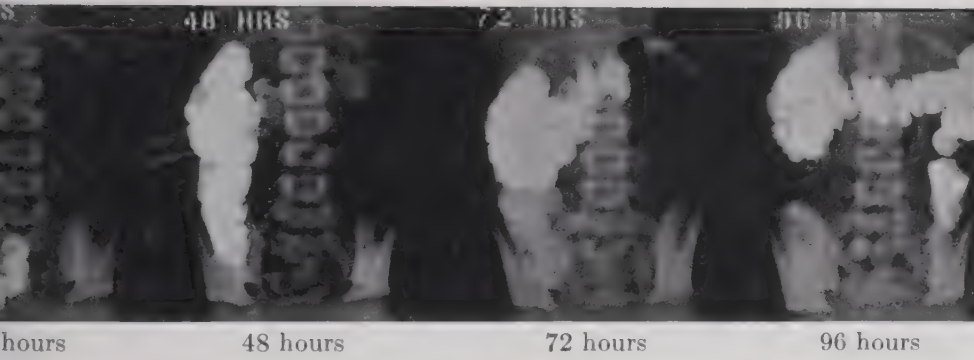
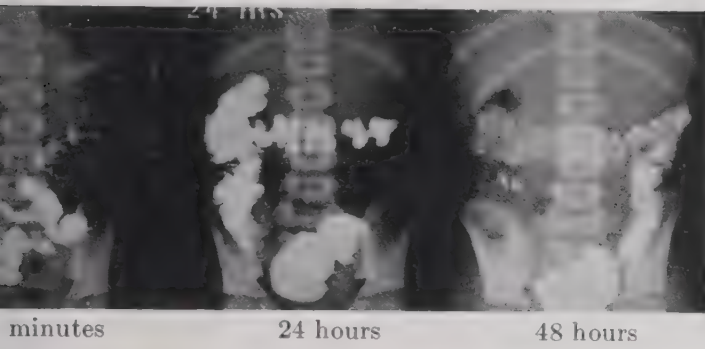


FIGURE 205. Progress of meal consisting of 2 ounces of barium sulfate, 4 ounces of standard pasteurized milk and 0.2-0.3 gm. carmine. The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

HERBERT  
Age, 120 months

LS THROUGH GASTROINTESTINAL TRACT



## ROENTGENOGRAMS OF PROGRESS OF BARIUM MEAL

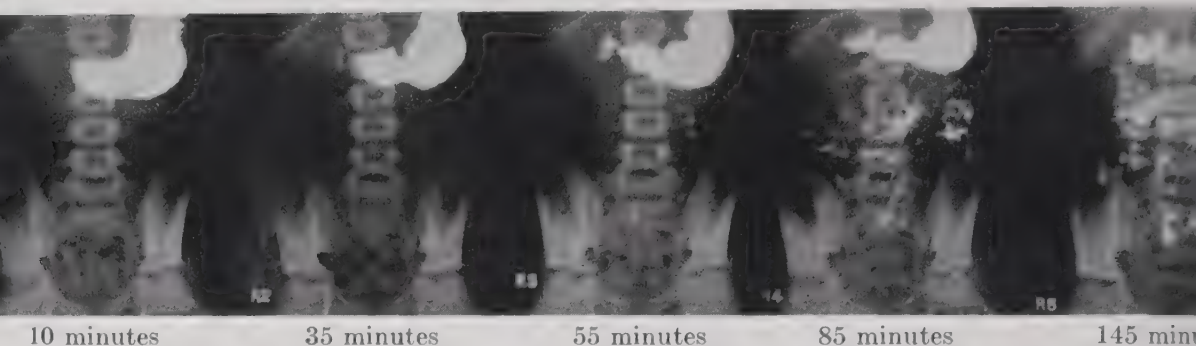


FIGURE 206. Progress of meal consisting of 2 ounces of barium sulfate and 4 ounces of standard pasteurized milk (3.5 per cent fat). The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

HERBERT  
Age, 120 months

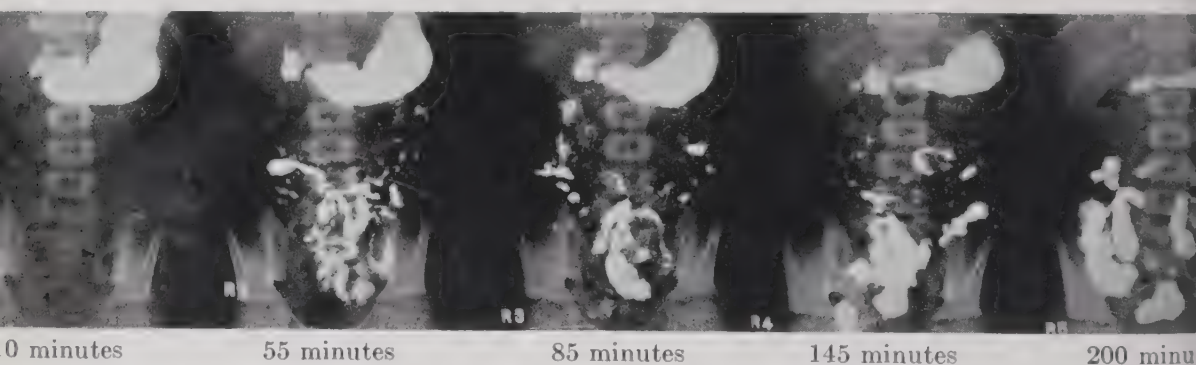


FIGURE 207. Progress of meal consisting of 2 ounces of barium sulfate and 4 ounces of evaporated milk, diluted 1:1 with water. The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

HERBERT  
Age, 120 months

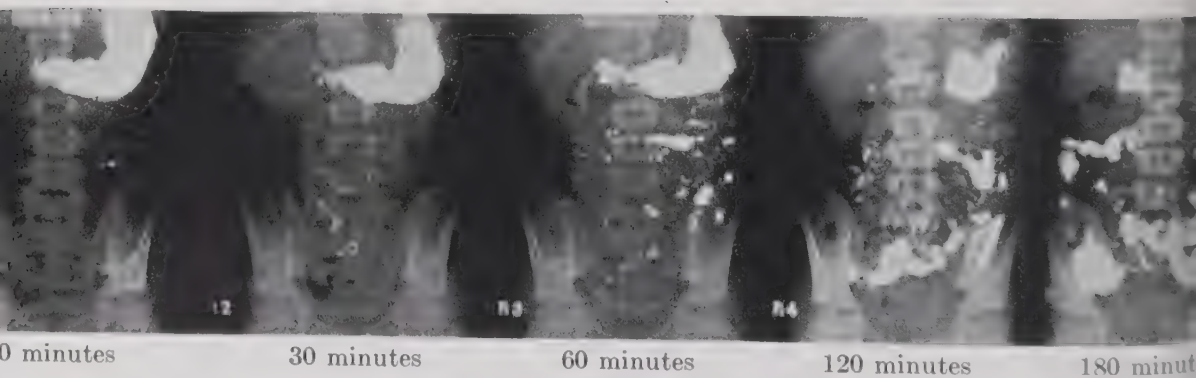


FIGURE 208. Progress of meal consisting of 2 ounces of barium sulfate and 4 ounces of base-exchanged milk. The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

HERBERT  
Age, 120 months



## LS THROUGH GASTROINTESTINAL TRACT

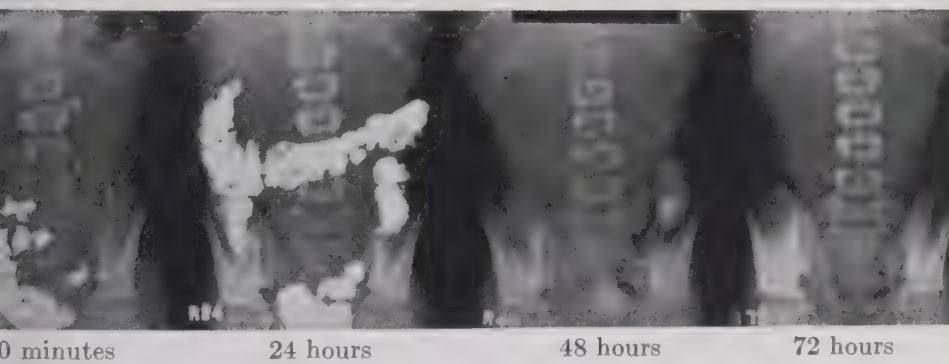
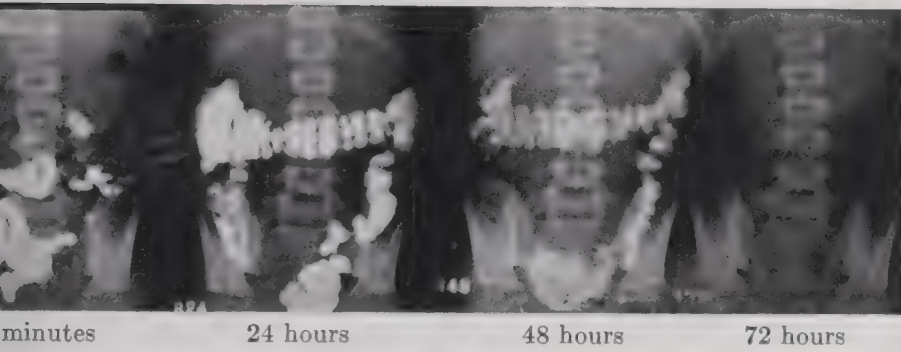
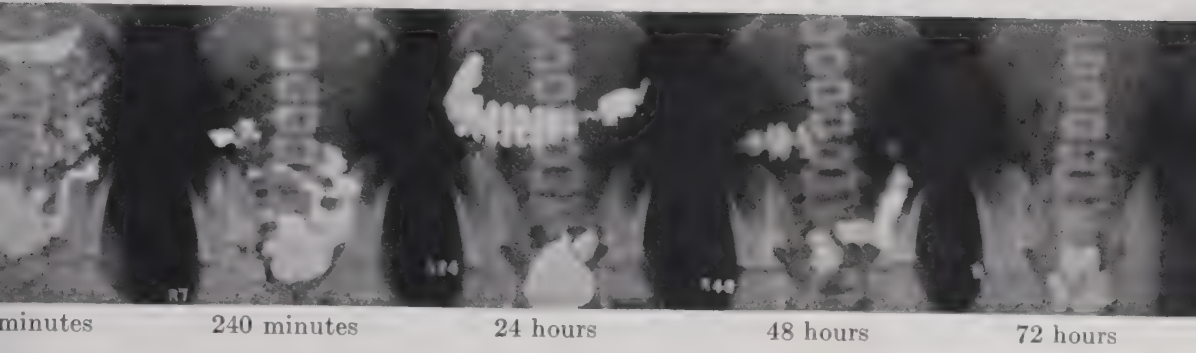






FIGURE 209. HERBERT, age 120 months.

TABLE 177

Herbert  
131 monthsFOOD INTAKE  
*Values in grams per day*

Food	DATE	Food	DATE	Food	DATE
	9-18 to 11-12		9-18 to 11-12		9-18 to 11-12
Apple	100	Cheese, American	20	Orange juice,	
Banana	150	Corn flakes	30	canned	100
Beef, lean	100	Egg, whole	100	Peanut butter	16
Bread, white	50	Gelatin	3	Peas, quick frozen	25
Bread,		Graham cracker	36	Potato	120
whole wheat	50	Honey	15	Salt	2
Butter	60	Lettuce	25	Sugar (average)	23
Cabbage	25	Milk, fluid,		Tomato juice	60
Carrot	50	irradiated	500	Water (average)	500

TABLE 178

Herbert  
131 months

## BODY LENGTH AND WEIGHT—INTAKE AND ELIMINATION

Date	Recumbent length*	Weight*	INTAKE			AVERAGE DAILY HEAT OF COMBUSTION			FECES				
			AVERAGE DAILY						AVERAGE DAILY			Laxation rate†	Elimination time‡
			Dry wt.‡	Total water†	Fat	In-take	Urine	Feces	Wet wt.	Dry wt.‡	Fat		
mo.-day	cm.	kg.	gm.	gm.	gm.	Cal.	Cal.	Cal.	gm.	gm.	gm.		hours
9-18	144	33.77	445	1742	108.6	2375	99	114	76.0	23.4	4.2	1.6	53
9-23	144	33.33	450	1652	110.6	2404	117	109	76.0	22.0	4.7	1.4	35
9-28	144	33.43	489	1655	118.2	2599	98	105	75.8	21.3	3.8	0.8	54
10-3	145	33.29	453	1669	113.4	2421	95	96	78.2	19.6	3.3	1.2	26
10-8	145	33.48	477	1782	114.2	2517	94	92	66.6	18.5	3.5	0.8	53
10-13	145	33.46	453	1707	113.0	2430	98	88	60.2	18.7	3.5	1.2	52
10-18	145	33.70	515	1613	114.3	2682	90	96	62.2	19.8	3.9	0.8	56
10-23	145	33.92	509	1676	113.1	2658	95	90	74.0	18.9	3.3	1.0	36
10-28	145	33.77	470	1693	110.5	2469	96	116	90.0	24.5	4.3	1.4	35
11-2	145	33.95	452	1687	112.8	2436	96	97	73.6	20.2	3.5	0.6	60
11-7	145	33.98	478	1696	112.2	2525	96	95	66.0	20.1	3.1	1.2	11

The age given is the initial age at start of study. Dates given are first days of five-day balance periods.

\* See Table 162 for actual values and method of smoothing.

† Based on vacuum-dried food and cryochem-dried feces. Corresponding values for alcohol-dried food and oven-dried feces are given in Table 597, page 1421.

‡ Drinking water plus water in foods.

§ Average number of defecations per day.

§ Elapsed time between ingestion and defecation of marker used to separate feces of five-day periods.

TABLE 179

Herbert  
131 months

## NITROGEN AND NEGATIVE MINERALS IN INTAKE, URINE, FECES

*Values are averages per day*

Date	NITROGEN			PHOSPHORUS			CHLORINE			SULFUR		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
9-18	12.90	11.58	1.43	1474	898	666	4423	4576	23	1010	816	136
9-23	12.68	11.57	1.31	1492	810	613	4345	4206	22	959	690	124
9-28	13.26	11.05	1.30	1469	794	550	4396	4327	28	1037	756	126
10-3	13.75	11.42	1.43	1525	814	496	4332	4139	25	991	824	118
10-8	13.07	11.41	1.08	1466	874	544	4161	4097	22	1058	792	103
10-13	13.39	11.15	1.02	1529	804	492	4290	4225	12	894	788	100
10-18	13.26	11.19	1.12	1529	824	536	4491	4069	20	1032	794	108
10-23	13.66	11.54	1.08	1531	834	497	4434	4290	24	1084	806	101
10-28	13.35	11.01	1.63	1450	754	574	4295	3862	25	950	799	147
11-2	13.47	11.18	1.21	1487	821	555	4446	4138	22	970	792	114
11-7	13.21	10.91	1.06	1559	793	485	4335	4079	16	1009	771	103

The age given is the initial age at start of study. Dates given are first days of five-day balance periods.

TABLE 180

Herbert  
131 months

## POSITIVE MINERALS IN INTAKE, URINE, FECES

*Values are averages per day*

Date	CALCIUM			MAGNESIUM			SODIUM			POTASSIUM		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
9-18	933	54	592	297	95	216	3048	2898	25	3491	3092	421
9-23	966	87	623	312	86	200	2982	2788	17	3405	2796	446
9-28	919	61	545	290	98	189	3069	2824	17	3411	2776	395
10-3	949	83	517	318	106	166	3059	2765	14	3487	2602	354
10-8	912	81	514	295	114	177	2966	2770	9	3487	2717	361
10-13	945	62	598	318	107	158	3068	2785	8	3503	2781	309
10-18	938	67	706	307	103	187	3018	2658	9	3501	2937	368
10-23	949	67	612	306	114	178	2990	2778	14	3528	3111	342
10-28	937	63	626	294	100	192	3024	2652	28	3465	2701	480
11-2	966	50	704	297	95	201	2996	2732	12	3512	2981	402
11-7	1000	48	655	309	103	170	2925	2700	9	3567	2826	344

TABLE 181

Herbert  
131 months

## COMPLEX CARBOHYDRATES IN INTAKE AND FECES

*Values in grams per day*

Date	LIGNIN		CELLULOSE		HEMICELLULOSE		
	Intake	Feces	Intake	Feces	INTAKE		Feces
					Total	Stable	
9-18	1.26	1.22	2.88	0.42	2.87	1.65	0.64
9-23	1.26	1.32	2.88	0.40	2.87	1.65	0.69
9-28	1.26	1.14	2.88	0.48	2.87	1.65	0.60
10-3	1.26	1.02	2.88	0.27	2.87	1.65	0.59
10-8	1.26	1.02	2.88	0.52	2.87	1.65	0.51
10-13	1.26	0.91	2.88	0.41	2.87	1.65	0.54
10-18	1.26	0.96	2.88	0.45	2.87	1.65	0.52
10-23	1.26	0.91	2.88	0.38	2.87	1.65	0.51
10-28	1.26	1.52	2.88	0.44	2.87	1.65	0.57
11-2	1.26	1.22	2.88	0.40	2.87	1.65	0.56
11-7	1.26	1.41	2.88	0.47	2.87	1.65	0.61

TABLE 182

Herbert  
131 months

## FAT PARTITION OF FECES

*Values in grams per day*

Date	Unsaponi- fiable	Neutral fat	Free fatty acids	Soap
9-18	1.16	0.23	0.27	2.50
9-23	1.25	0.20	0.32	2.89
9-28	1.14	0.16	0.28	2.23
10-3	1.01	0.14	0.33	1.83
10-8	1.11	0.13	0.28	1.98
10-13	1.08	0.22	0.23	1.99
10-18	1.09	0.28	0.27	2.22
10-23	1.05	0.16	0.24	1.88
10-28	1.15	0.25	0.35	2.56
11-2	1.14	0.17	0.28	1.88
11-7	1.23	0.18	0.28	1.45

The age given is the initial age at start of study. Dates given are first days of five-day balance periods.



TABLE 183

Herbert  
131 months

## NITROGEN PARTITION OF URINE

*Values in grams of nitrogen per day*

Date	Urine volume	Total nitrogen	Urea	Ammonia	Creatinine + Creatine	Creatinine	Uric acid
9-18	728	10.850	9.239	0.251	0.366	0.333	0.159
9-19	990	11.528	10.034	0.326	0.396	0.333	0.139
9-20	990	12.072	10.273	0.311	0.364	0.312	0.164
9-21	655	11.647	9.924	0.229	0.450	0.341	0.135
9-22	570	11.596	9.869	0.301	0.329	0.311	0.147
9-23	738	11.959	10.299	0.311	0.408	0.334	0.162
9-24	762	11.559	9.535	0.345	0.382	0.296	0.143
9-25	743	11.340	9.408	0.282	0.394	0.312	0.180
9-26	813	11.790	9.950	0.290	0.411	0.331	0.179
9-27	850	11.220	9.985	0.289	0.352	0.327	0.202
9-28	577	10.824	9.387	0.263	0.350	0.313	0.192
9-29	985	11.934	10.261	0.282	0.393	0.352	0.149
9-30	933	10.606	8.663	0.265	0.357	0.329	0.113
10-1	1020	10.548	9.208	0.270	0.362	0.309	0.134
10-2	795	10.800	9.330	0.284	0.389	0.336	0.128
10-4	520	11.232	9.783	0.257	0.411	0.325	0.132
10-5	670	11.726	10.142	0.438	0.400	0.352	0.134
10-6	630	11.272	9.790	0.240	0.387	0.320	0.139
10-7	888	11.449	10.108	0.356	0.370	0.340	0.130
10-8	407	6.981	6.049	0.155	0.291	0.235	0.122
10-9	713	14.684	13.003	0.327	0.509	0.414	0.160
10-10	1100	11.984	10.472	0.336	0.382	0.321	0.147
10-11	820	11.394	10.071	0.279	0.397	0.342	0.139
10-12	912	11.976	10.505	0.283	0.413	0.341	0.135
10-13	905	11.328	9.876	0.276	0.388	0.332	0.134
10-14	635	11.310	9.934	0.246	0.389	0.310	0.131
10-15	625	11.204	9.600	0.240	0.363	0.295	0.120
10-16	1010	10.777	9.312	0.269	0.365	0.327	0.133
10-17	1070	11.349	9.838	0.302	0.401	0.321	0.149
10-18	565	10.246	8.902	0.318	0.342	0.295	0.136
10-19	515	11.410	10.088	0.302	0.340	0.322	0.142
10-20	590	11.130	9.616	0.334	0.387	0.312	0.128
10-21	900	11.640	10.178	0.370	0.382	0.329	0.122
10-22	910	11.403	9.768	0.348	0.386	0.357	0.150
10-23	678	10.776	9.342	0.338	0.375	0.310	0.125
10-24	670	11.462	10.112	0.238	0.359	0.338	0.141
10-25	826	11.399	10.086	0.264	0.352	0.312	0.138
10-26	980	12.330	10.803	0.273	0.401	0.345	0.144
10-27	955	11.729	10.146	0.246	0.378	0.336	0.143
10-28	930	11.255	9.552	0.252	0.384	0.316	0.134
10-29	625	10.847	9.372	0.258	0.374	0.336	0.126
10-30	813	11.318	9.618	0.292	0.389	0.313	0.138
10-31	688	10.554	9.154	0.276	0.365	0.332	0.128
11-1	900	10.920	9.395	0.241	0.408	0.332	0.150
11-2	1110	11.746	10.310	0.260	0.375	0.313	0.149
11-3	663	11.426	9.958	0.262	0.405	0.359	0.142
11-4	710	11.516	9.682	0.268	0.413	0.346	0.120
11-5	810	11.031	9.563	0.249	0.368	0.336	0.144
11-6	755	10.718	9.332	0.248	0.361	0.348	0.135
11-7	1080	10.408	9.087	0.312	0.348	0.329	0.130
11-8	698	10.794	9.235	0.245	0.350	0.324	0.137
11-9	680	11.278	10.030	0.280	0.342	0.315	0.136
11-10	995	11.148	7.844	0.268	0.362	0.364	0.120
11-11	562	10.676	9.478	0.232	0.434	0.329	0.135

The age given is the initial age at start of study. Urine volumes are in milliliters.

TABLE 184

Herbert  
131 months

## TITRABLE ACIDITY AND ORGANIC ACID IN URINE

*Values in milliequivalents per day*

Date	Titration acidity	pH	Total organic acid	Date	Titration acidity	pH	Total organic acid
9-18	22.4	6.40	32.4	10-16	16.1	6.38	31.2
9-19	28.9	5.28	36.9	10-17	17.6	6.41	32.6
9-20	31.2	5.50	37.6	10-18	20.2	6.23	32.3
9-21	18.0	6.41	34.2	10-19	18.7	6.37	33.5
9-22	29.2	5.83	35.1				
				10-20	13.4	6.88	34.4
9-23	29.6	5.44	36.7	10-21	15.6	6.50	33.4
9-24	25.7	5.50	32.0	10-22	10.8	6.63	31.6
9-25	24.1	5.90	32.8	10-23	16.1	6.47	33.4
9-26	24.7	5.80	33.0				
9-27	20.6	5.97	38.0	10-24	19.2	6.28	34.2
				10-25	21.6	6.11	34.0
9-28	21.7	5.88	34.2	10-26	14.6	6.45	35.6
9-29	20.2	6.10	35.4	10-27	19.8	6.19	34.2
9-30	22.6	5.80	30.2				
10-1	15.2	6.48	35.7	10-28	18.4	6.32	35.6
10-2	10.5	6.70	34.5	10-29	21.0	5.91	31.9
				10-30	24.4	5.72	35.7
10-3	—	—	—	10-31	24.0	5.66	33.6
10-4	18.8	6.28	33.4				
10-5	17.9	6.47	35.2	11-1	18.7	6.07	37.2
10-6	17.9	6.30	35.4	11-2	17.8	6.15	31.6
10-7	14.0	6.40	30.4	11-3	24.4	5.83	33.0
				11-4	23.3	7.00	32.1
10-8	7.4	6.72	24.4				
10-9	26.5	5.02	41.2	11-5	14.4	6.34	32.8
10-10	20.1	6.30	30.2	11-6	18.5	6.22	33.3
10-11	28.6	5.82	31.2	11-7	16.6	6.23	32.2
10-12	20.5	6.23	28.8	11-8	14.2	6.40	23.9
10-13	20.0	6.32	31.8	11-9	20.2	6.12	33.8
10-14	19.5	6.22	32.6	11-10	16.6	6.32	30.1
10-15	23.4	6.02	30.0	11-11	26.0	5.78	25.8

The age given is the initial age at start of study.

TABLE 185

Herbert  
131 months

## VOLUME, WEIGHT AND SULFUR PARTITION OF URINE

*Values are averages per day*

Date	Volume	Specific gravity	Wet weight	Dry weight*	SULFUR PARTITION		
					Inorganic	Ethereal	Neutral
mo.-day	ml.		gm.	gm.	mg.	mg.	mg.
9-18†	787	1.028	809	48.9	—	—	—
9-23†	781	1.028	803	48.1	—	—	—
9-28†	862	1.027	885	45.9	636	55	65
10-3†	677	1.034	700	46.3	679	48	97
10-8†	790	1.032	815	46.5	679	50	63
10-13†	849	1.031	875	46.4	661	48	79
10-18†	696	1.034	720	47.5	664	49	81
10-23†	822	1.032	848	48.4	690	50	66
10-28†	791	1.038	821	46.7	660	60	79
11-2†	810	1.037	840	46.9	646	70	76
11-7†	803	1.030	827	46.6	—	—	—
11-7‡	—	—	—	—	604	52	63
11-8‡	—	—	—	—	661	60	61
11-9‡	—	—	—	—	674	65	83
11-10‡	—	—	—	—	626	62	76
11-11‡	—	—	—	—	732	52	66

\* Cryochem dried.

† Determined upon five-day composites and corrected for precipitate solubility.

‡ Determined upon daily urine collections and corrected for precipitate solubility.

TABLE 186

Herbert  
131 months

## IRON, COPPER, ZINC IN INTAKE, URINE, FECES\*

*Values are averages per day*

Date	IRON			COPPER			ZINC		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
9-18	9.92	0.28	9.40	4.60	0.24	1.46	14.76	0.48	8.32
9-23	10.43	0.00	8.36	4.13	0.16	1.37	16.62	0.46	6.73
9-28	12.35	0.15	7.18	5.59	0.30	1.26	16.28	0.44	7.76
10-3	11.06	0.00	6.44	4.79	0.11	1.23	16.38	0.52	7.54
10-8	16.40	0.20	7.09	4.81	0.38	1.21	15.16	0.60	6.14
10-13	11.10	0.30	7.25	4.72	0.34	1.11	17.18	0.58	5.48
10-18	12.76	0.41	8.01	6.15	0.42	1.32	15.79	0.47	8.01
10-23	14.36	0.39	7.73	6.50	0.41	1.28	17.25	0.60	6.38
10-28	13.20	0.00	8.69	5.31	0.37	1.48	16.28	0.70	8.48
11-2	10.23	0.00	8.17	5.29	0.23	1.41	18.35	0.18	7.79
11-7	8.50	0.20	7.90	5.00	0.15	1.21	15.20	0.54	7.39

The age given is the initial age at start of study. Dates given are first days of five-day balance periods.

\* Determined polarographically.

TABLE 187

Herbert  
131 months

IRON, MANGANESE, COPPER, ALUMINUM, LEAD, TIN  
IN INTAKE, FECES\*

*Values in milligrams per day*

Date	IRON		MANGANESE		COPPER	
	Intake	Feces	Intake	Feces	Intake	Feces
9-18	11.24	—	2.04	—	2.79	—
9-23	10.59	—	1.87	—	2.37	—
9-28	10.11	10.97	2.27	1.81	4.39	1.34
10-3	12.84	7.19	2.03	1.61	3.80	1.78
10-8	14.35	—	2.27	—	3.67	—
10-13	11.80	—	2.16	—	3.65	—
10-18	12.49	10.34	2.19	1.98	6.26	2.04
10-23	12.79	8.15	2.22	1.88	4.29	2.02
10-28	11.36	—	2.18	—	4.75	—
11-2	10.57	8.95	1.80	2.04	2.53	1.88
11-7	9.34	7.86	1.81	1.82	2.91	1.74

	ALUMINUM		LEAD		TIN	
	Intake	Feces	Intake	Feces	Intake	Feces
9-18	4.55	—	0.58	—	1.33	—
9-23	3.95	—	0.56	—	1.52	—
9-28	3.00	1.84	0.52	0.32	1.79	1.37
10-3	3.53	1.27	0.52	0.26	3.32	1.70
10-8	2.58	—	0.62	—	1.54	—
10-13	2.13	—	0.45	—	0.92	—
10-18	3.66	1.44	0.67	0.34	0.77	1.00
10-23	2.86	1.57	0.62	0.28	0.72	0.62
10-28	3.17	—	0.52	—	0.70	—
11-2	3.40	1.37	0.66	0.35	0.75	0.70
11-7	2.29	1.32	0.52	0.28	0.76	0.62

\* Determined spectrographically by the method of Brody, James K. and Ewing, D. T. Spectrographic determination of some metallic elements in food and feces. *Indus. Engin. Chem. (Anal. Ed.)* 17: 627, 1945.

TABLE 188

Herbert  
131 months

MANGANESE, NICKEL IN INTAKE, URINE, FECES

*Values are averages per day*

Date	MANGANESE			NICKEL*		
	Intake†	Urine*	Feces†	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mg.	mg.	mg.
9-18	2.04	0.014	2.41	1.183	0.018	0.534
9-23	1.95	0.004	2.10	0.899	0.012	0.571
9-28	2.23	0.000	2.11	0.963	0.000	0.429
10-3	2.05	0.044	2.00	1.035	0.034	0.451
10-8	2.27	0.000	2.29	1.438	0.013	0.550
10-13	2.18	0.000	2.04	0.527	0.023	0.422
10-18	2.41	0.026	2.21	1.524	0.024	0.490
10-23	2.30	0.000	1.93	1.632	0.000	0.371
10-28	2.36	0.000	2.10	0.980	0.000	—
11-2	2.06	0.005	2.26	0.873	0.004	0.418
11-7	2.16	0.000	2.03	1.165	0.012	—

The age given is the initial age at start of study. Dates given are first days of five-day balance periods. Italic figures were omitted from calculations of averages given in Volume I.

\* Determined polarographically.

† Determined chemically



TABLE 188A

Herbert  
131 months

CARBON IN INTAKE, URINE, FECES  
*Values in grams per day*

Date	Intake	Urine	Feces	Date	Intake	Urine	Feces
9-18	215.2	9.0	10.2	10-18	215.2	9.2	8.8
9-23	215.2	8.8	10.1	10-23	215.2	8.8	8.0
9-28	215.2	8.7	9.4				
10-3	215.2	8.2	8.7	10-28	215.2	9.0	11.0
10-8	215.2	8.4	8.3	11-2	215.2	8.7	8.7
10-13	215.2	8.4	7.9	11-7	215.2	9.2	8.5

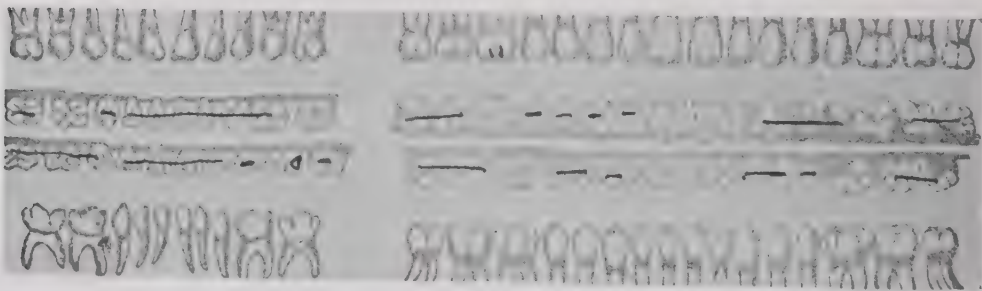
TABLE 189

Herbert  
131 months

SALIVA CULTURE ESTIMATION OF CARIES ACTIVITY

Date	QUANTITATIVE*			QUALITATIVE†	COLOR REACTION TEST‡			
	Lacto- bacilli	Cocci	Yeast		hours after preparation			
					24	48	72	96
mo.-day	colonies per ml. of saliva							
9-22	0	0	0	—	0	0	0	0
10-23	0	0	0	—	0	0	0	0
10-31	0	0	0	—	0	0	0	0
11-7	0	0	250	+	0	0	1	2
11-14	0	0	20	—	0	1	1	3

\* 0.2 ml. saliva to tomato agar plate.  
† 1.0 ml. saliva in acid glucose broth.  
‡ 0.2 ml. saliva into melted beef agar.



HERBERT  
FIGURE 210. Dental examination, age 133 months.



## HERBERT

FIGURE 211. Actual size reproduction of roentgenogram of left hand.  
Chronological age 131 months.



## HERBERT

FIGURE 212. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 131 months.



HERBERT

FIGURE 213. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 131 months.





## HERBERT

FIGURE 214. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 131 months.



HERBERT

FIGURE 215. Actual size reproduction of roentgenogram of left hip.  
Chronological age 131 months.



HERBERT

FIGURE 216. Actual size reproduction of roentgenogram of left knee.  
Chronological age 131 months.



HERBERT

FIGURE 217. Actual size reproduction of roentgenogram of left knee.  
Chronological age 131 months.





HERBERT

FIGURE 218. Actual size reproduction of roentgenogram of left foot.  
Chronological age 131 months.



HERBERT

FIGURE 219. Actual size reproduction of roentgenogram of left foot.  
Chronological age 131 months.



FIGURE 220. HERBERT, age 168 months.



HERBERT

FIGURE 221. Actual size reproduction of roentgenogram of left hand.  
Chronological age 168 months.





FIGURE 222. HERBERT, age 190 months.



FIGURE 223. HERBERT. Actual size reproduction of roentgenogram of left hand.  
Chronological age 190 months.



FIGURE 223A. HERBERT, age 190 months.

## JIMMY

Jimmy, Herbert's brother, was born February 13, 1931. During the seventh month of pregnancy, the mother developed pyelonephritis. Delivery was instrumental, the baby weighing 8 pounds, 8 ounces, at birth. Early childhood was uneventful except for measles.

### Medical History

Jimmy was 52 months old when he was placed in the care of the Village. At that time pediatric examination revealed no abnormalities except a slight systolic murmur over the third, left, interstitial space. The only prior illness recorded was measles. Schick, Dick, Pirquet and Wassermann tests were negative. Jimmy was 56 months old when he joined the group of children participating in the second study of nutrition and chemical growth in childhood.

In December Jimmy had a very slight cold for two days. January 1 he was given syrup of cocillana for a cough. On January 3 he complained of a stomachache at noon and was put to bed when his temperature was found to be 103°. He was in bed the following day but ate with the group on the third day. By January 7 he "enjoyed putting snow down the girls' necks." Examination by the pediatrician, January 8, revealed only a few coarse râles remaining. March 21 Jimmy again had a cold and cough but no fever. The next day he was kept in bed by the cold but the following day he seemed quite normal.

### Psychological

During both of the studies in which he participated Jimmy was a quick, active child and always a leader in group activities. He was extremely pugnacious and enjoyed starting quarrels, "showing off" with various stunts, teasing the other children and acting "contrary."

Jimmy was tested when he was 58 months old. On the Stanford-Binet test his M.A. was 54 months, I.Q. 93; on the Good-enough test, M.A. 63 months, I.Q. 109.

He was very friendly towards the examiner and responded quickly to an interest in him. He talked freely, almost excessively. He talked about the test materials as he worked with them. He was



very anxious to have the examiner's praise. He wanted to take the games and pictures home with him. Several times he mentioned the fact that he wanted to go to a farm sometime. When questioned about this he said he would like to go when he is big "so I can ride on the horses." He prefers his right hand for writing and drawing.

Jimmy is a boy of normal intellectual capacity. On the Binet test his rating was at the low average range. He had a basal age of year 3. He passed all the tests at year 4 except that of drawing a square; his perception of forms tends to be weak. He failed another test of this type at year 5 and also the test of aesthetic comparisons. His memory capacity and vocabulary are at the 5 year level. In drawing the picture of a man his performance was at the high-range average level.

When 109 months old Jimmy was tested at another agency. He was given the Revised Stanford-Binet, L Scale. His M.A. was 112 months, I.Q. 103.

### Endocrinological

Jimmy was 62 months old when classified by the endocrinologist, from the medical history, growth records, basal metabolism, physical examination and the roentgenograms of hip, shoulder, knee, elbow, foot and hand.

Gain of 1.9 inches since June 19, a period of 9 months. Normal increment for this time and age is 1.8 inches. None of the deciduous teeth has exfoliated. Both testicles are in the canal; easily palpable in the canal but do not descend into the scrotum. Otherwise presents no gross endocrine abnormalities.

#### *Roentgenographic Study for Osseous Development*

Wrist: Capitate, hamate, triangularis, and lunate are present.

Distal epiphysis of the radius is present and normally developed. Epiphyses of the phalanges and metacarpals are present and normally developed.

Ankle: Talus, cuboid, calcaneus, external cuneiform, internal cuneiform, midcuneiform, and navicular are normally present.

Distal epiphysis of the tibia and fibula are present and normally developed.

Hip: Epiphysis of the greater trochanter, which normally appears at four, is present and normally developed. All other centers are present and normally developed.

Knee: Distal epiphysis of the femur and proximal epiphyses of the tibia and fibula are present and normally developed. The patella, which normally makes its appearance at five, is barely discernible.

Diagnosis: Normal osseous development.

Classification: Partial cryptorchid.

TABLE 190

Jimmy

RECUMBENT LENGTH AND WEIGHT

Age	RECUMBENT LENGTH		Weight	Age	RECUMBENT LENGTH		Weight
	Total	Stem			Total	Stem	
mo.-days	cm.	cm.	kg.	mo.-days	cm.	cm.	kg.
52-27	101.6	—	16.33	61-19	110.2	62.9	—
55-0	104.8	—	16.90	61-20	—	—	18.70
55-22	—	—	16.81	61-22	109.9	62.5	—
55-28	—	—	16.88	61-25	—	—	18.82
56-2	—	—	16.89	61-26	110.0	62.7	—
56-6	106.7	61.0	—	62-0	—	—	18.80
56-8	—	—	16.88	62-3	110.2	62.5	—
				62-4	—	—	19.00
56-12	—	—	16.78				
56-19	—	—	16.82	62-8	110.5	62.9	—
56-23	—	—	16.86	62-9	—	—	18.97
56-28	107.3	62.2	—	62-15	110.8	62.7	—
57-0	—	—	16.86	62-16	—	—	19.35
57-3	—	—	16.90	62-19	111.1	62.5	19.50
57-8	—	—	16.88	62-24	—	—	19.60
				62-25	111.0	62.9	—
57-14	107.6	61.6	—				
57-15	—	—	16.88	63-0	—	—	19.45
57-20	—	—	16.82	63-2	111.3	62.5	—
57-23	—	—	16.88	64-1	111.4	61.2	19.18
57-28	107.6	61.3	—	65-3	111.7	62.3	19.32
58-0	—	—	17.19	66-7	112.7	62.7	19.43
58-5	—	—	17.27	67-6	113.3	62.8	19.75
				68-5	112.8	62.2	19.93
58-8	107.3	61.6	—				
58-11	—	—	17.35	69-8	114.5	63.8	20.59
58-15	—	—	17.50	70-6	114.9	64.0	20.88
58-18	—	—	17.54	73-18	117.4	65.3	21.91
58-26	—	—	17.52	76-26	118.5	64.2	22.11
58-29	108.1	61.8	—	91-16	125.7	70.0	25.85
59-1	—	—	17.75	103-5	—	—	27.54
				103-10	—	—	26.93
59-5	108.0	61.6	—				
59-6	—	—	17.85	103-16	—	—	27.12
59-10	—	—	18.15	103-20	132.4	70.6	26.84
59-13	—	—	18.19	103-23	132.0	70.9	—
59-20	—	—	18.30	103-25	132.0	72.1	27.14
59-23	108.6	61.6	—	103-27	132.3	71.6	—
59-25	—	—	18.50	103-29	131.6	71.6	—
				104-1	—	—	26.80
60-0	—	—	18.58				
60-4	108.2	61.6	—	104-6	—	—	26.94
60-6	—	—	18.42	104-11	—	—	27.18
60-8	—	—	18.55	104-16	—	—	27.10
60-15	—	—	18.77	104-22	—	—	27.11
60-19	—	—	18.75	104-25	132.9	72.3	27.23
60-23	—	—	18.70	104-27	131.9	72.6	—
				104-28	132.0	72.2	—
60-27	109.9	62.2	—				
60-29	—	—	18.70	105-0	132.6	72.1	—
61-4	—	—	18.74	105-1	131.6	71.8	—
61-5	109.9	62.2	—	105-2	—	—	27.06
61-9	109.9	62.5	18.65	140-4	146.6	80.0	38.10
61-14	109.9	62.2	18.75	162-16	163.2	84.4	52.16

Actual values are averages of independent measurements by two workers. In calculating the smooth values given with the balance data the actual values given above were smoothed by three-point averaging and the resulting figures entered for their respective balance periods. Values for balance periods intervening between measurements were obtained by interpolation.

## ANTHROPOMETRIC MEASUREMENTS

*Values in centimeters*

Age*	BREADTH			LENGTH		WIDTH	
	Biaero- mial	Intertro- chanteric	Inter- crystal	Tibia	Head	Chest	Head
57	19.7	19.0	18.0	22.3	17.0	17.8	14.5
58	21.1	18.6	17.0	21.9	17.0	17.4	14.5
59	20.0	19.3	18.0	21.9	17.1	17.5	14.5
60	20.8	19.5	18.4	22.8	17.2	17.7	14.6
61	21.2	20.0	18.5	22.6	17.1	17.6	14.6
62	21.5	19.6	17.6	22.7	17.1	18.0	14.7
63	21.8	19.6	19.0	23.2	17.2	18.2	14.7
64	21.8	20.0	18.0	23.5	17.0	18.0	14.7
65	22.5	19.9	17.8	23.9	17.0	17.8	14.7
66	22.9	20.0	17.8	23.7	17.0	17.8	14.6
67	22.8	19.9	17.9	24.2	17.4	17.6	14.7
68	22.8	20.1	18.4	24.4	17.2	18.3	14.8
69	23.2	20.3	18.2	24.6	17.3	18.0	14.8
70	23.4	20.2	18.2	24.5	17.3	18.0	14.8
74	22.5	20.8	18.3	25.2	17.2	18.8	14.8
77	23.4	21.0	19.2	—	17.3	19.0	14.8
91	24.2	—	20.2	27.7	17.5	20.4	15.0
103	24.7	—	20.3	29.0	17.5	20.0	15.0
104	24.5	—	20.0	29.5	17.6	20.0	15.0
105	25.2	—	20.2	29.0	17.5	20.3	15.0
140	32.2	25.0	24.5	42.0	17.8	23.1	15.3
163	37.4	23.7	25.1	41.2	18.5	27.3	16.1

Age*	DEPTH	CIRCUMFERENCES				
	Chest	Head	Chest	Thigh	Abdomen	Upper arm
57	13.2	50.2	53	29	50	15.0
58	13.4	50.2	54	29	50	15.0
59	14.0	50.0	56	29	53	15.8
60	13.5	50.6	55	31	53	16.0
61	13.5	50.7	55	30	52	16.5
62	13.7	50.8	54	31	55	16.3
63	13.5	51.0	54	32	54	16.4
64	13.4	51.0	56	30	52	15.6
65	13.4	51.0	57	29	53	15.8
66	13.6	51.0	55	29	53	15.0
67	13.8	51.1	56	30	54	15.6
68	13.5	51.1	58	30	53	16.0
69	13.5	51.4	57	31	55	16.0
70	14.0	51.5	57	32	56	17.0
74	14.0	51.5	60	34	56	16.5
77	13.6	51.5	61	32	57	17.0
91	15.3	52.0	63	35	60	17.4
103	15.5	52.0	64	36	60	19.0
104	15.8	52.3	65	36	57	18.2
105	15.0	52.3	66	36	58	18.3
140	16.4	52.3	69	41	70	20.4
163	17.7	54.0	75	46	69	23.5

\* Months.

TABLE 192

Jimmy

## BLOOD DETERMINATIONS

Age	Date	Red cells	Hemo- globin	WHITE BLOOD CELLS						
				Total	Poly- morpho- nuclears	Lym- pho- cytes	Mono- cytes	Eosino- philes		
months	mo.-day	millions	gm./100 cc.	per c. mm.	per cent	per cent	per cent	per cent		
53	7-11	4.48	12†	5650	49	43	5	2		
61	3-17	4.34	13†	7950	43	47	9	3		
63	5-15	4.63	12†	11700	52	36	11	1		
*63	5-15	4.78	12†	—	—	—	—	—		
77	7-8	4.75	12†	8450	44	43	5	5		
*103	9-12	4.05	13†	4700§	46	40	12	2		
63 103	5-15 9-12	Hematocrit		RED BLOOD CELL MEASUREMENT						
				Volume	Weight	Diameter	Thickness			
		per cent	c.μ	μμg.	μ	μ				
		40	83	90	7.3	2.0				
		40	98	—	7.3	2.3				
		MINERALS (mg. per 100 ml.)								
		SERUM					ERYTHROCYTES			
		Cal- cium	Phos- phorus	So- dium	Potas- sium	Chlor- ine	So- dium	Potas- sium	Chlor- ine	
		10.1	4.41	—	—	—	—	—	—	
		10.8	6.56	317	16.0	359	34	502	181	
103	9-12	11.6	6.11	319	18.5	364	35	392	158	
55 63 103	9-16 5-15 9-12	PLASMA NITROGEN AND LIPID (mg. per 100 ml.)								
		Nitro- gen	Total lipid	Phos- pholipid	Neutral fat	CHOLESTEROL				
						Total	Free	Esters		
		1002	434	142	66	152	45	182		
		ERYTHROCYTE NITROGEN AND LIPID (mg. per 100 gm.)								
		4433	448	271	56	115	104	18		
		63	5-15	Red blood cells total solids: 34.6 per cent by weight.						

\* Venous blood.

† Haden-Hauser.

‡ Evelyn photoelectric colorimeter.

§ Heparin.



TABLE 193

Jimmy

## HEIGHT AND WEIGHT RECORD\*

Age	Height	Weight	Age	Height	Weight	Age	Height	Weight
months	inches	pounds	months	inches	pounds	months	inches	pounds
47	40 $\frac{1}{4}$	40 $\frac{3}{4}$	99	51 $\frac{1}{4}$	59	131	55 $\frac{1}{2}$	78 $\frac{1}{2}$
52	40 $\frac{1}{4}$	38	114	52 $\frac{1}{2}$	67	136	56 $\frac{1}{4}$	80
58	41 $\frac{3}{4}$	40 $\frac{1}{4}$				141	57 $\frac{1}{4}$	83 $\frac{1}{2}$
77	46 $\frac{3}{4}$	50	121	54	72	148	59 $\frac{1}{4}$	96 $\frac{1}{2}$
89	48 $\frac{3}{4}$	55	125	54 $\frac{1}{2}$	73 $\frac{1}{2}$	159	62 $\frac{1}{8}$	111 $\frac{1}{2}$

\* Clinical. See also table of recumbent lengths and weights.

TABLE 194

Jimmy

## MEASUREMENTS OF THE BONES OF THE WRIST

AGE, months	53	55	61	63	77	103	140	163
CARPALS								
AREA, sq. mm.								
Hamate	54	56	62	67	82	116	164	242
Capitate	79	86	97	101	131	196	253	353
Lesser Multangular					22	51	86	120
Greater Multangular		1	4	6	23	54	98	166
Navicular			4	7	31	68	156	286
Lunate	6	8	16	18	38	72	130	193
Triangular	30	34	40	42	58	84	132	170
Pisiform							21	108
GREATEST DIAMETER, mm.								
Hamate	9	10	11	11	12	15	18	22
Capitate	12	13	14	14	16	20	23	27
Lesser Multangular					5	9	12	13
Greater Multangular		1	3	3	6	10	12	13
Navicular			3	4	6	11	20	26
Lunate	2	4	5	6	8	12	16	21
Triangular	7	8	8	9	10	13	16	18
Pisiform							7	13
Epiphyses								
1st Metacarpal	4	5	5	6	7	9	12	15
2nd Metacarpal	7	8	8	9	9	11	12	16
3rd Metacarpal	6	7	8	8	8	11	12	17
4th Metacarpal	5	6	6	7	7	9	10	13
ULNA								
DIAMETER, mm.								
Distal epiphysis					3	11	16	17
Distal metaphysis	12	13	13	13	15	16	18	18
RADIUS								
DIAMETER, mm.								
Distal epiphysis	15	15	16	17	19	22	27	35
WRIST AREA,* sq. mm.	951	930	998	1012	1173	1332	1595	2070

\* Measured with the planimeter using Flory's landmarks (Monographs of the Society for Research in Child Development, Vol. I, No. 3, 1936).

TABLE 195

Jimmy

SKELETAL MATURATION  
*Values in months*

Chrono- logical age	HAND				FOOT	ELBOW	KNEE	HIP	SHOULDER	AVERAGE
	B.B.G.*	Flory†	Kelly‡	Todd§	Todd§	Todd§	Todd§	Todd§	Todd§	Todd§
53	55	29	<72	44	46	46	51	44	48	46
55	61	34	<72	47	49	48	54	48	51	49
61	63	38	<72	50	53	52	57	52	55	53
63	69	43	74	53	55	52	60	55	57	55
77	92	67	88	82	74	76	82	81	76	78
103	118	90	114	105	109	105	105	107	99	105
140	186	115	152	137	—	—	—	—	—	—
163	204	138	182	160	—	—	—	—	—	—

\* Baldwin, B. T., Busby, L. M., Garside, H. V. Anatomic growth of children, University of Iowa Studies in Child Welfare, vol. 4, no. 1, 1928.

† Flory, C. D. Osseous development in the hand as an index of skeletal development. Monographs of the Society for Research in Child Development, vol. 1, no. 3, 1936.

‡ Kelly, H. J. Anatomic age and its relation to stature. University of Iowa Studies in Child Welfare, vol. 12, no. 5, 1937. (No standards less than 72 months.)

§ Determined by T. Wingate Todd, C. C. Francis and S. Idell Pyle, Western Reserve University, Cleveland.

TABLE 196

Jimmy

BASAL METABOLISM MEASUREMENTS

Age	Date	Sur- face area*	Respi- ration	Pulse rate	Body temper- ature	Blood pres- sure	Basal metab- olism
months	mo.-day	sq.m.	per min.	per min.	°F	S/D†	Cal./24 hr.
56	10-6	0.705	23	—	—	—	986
56	10-19	0.705	18	—	—	—	948
57	11-10	0.708	13	72	98.6	84/60	953
57	11-26	0.710	14	74	98.7	96/58	979
58	12-10	0.712	15	74	98.2	92/60	974
59	1-10	0.726	20	76	98.8	95/62	941
59	1-16	0.728	20	79	98.8	98/58	955
60	2-3	0.741	21	91	98.8	96/62	986
60	2-14	0.741	18	90	98.6	96/60	931
61	3-8	0.753	21	84	98.2	92/69	1061
61	3-16	0.753	20	82	98.2	88/74	1042
61	3-20	0.752	17	94	98.6	102/56	1070
61	3-25	0.754	22	92	98.7	98/62	979
62	3-30	0.755	22	84	98.6	92/68	991
62	4-2	0.755	20	74	98.2	102/68	1013
62	4-6	0.755	19	88	98.6	100/60	1008
62	4-13	0.759	20	86	98.6	100/60	974
62	4-18	0.760	21	80	98.0	100/60	974
62	4-25	0.768	21	100	98.7	98/60	1042
63	4-29	0.772	24	84	98.0	100/64	878
63	5-5	0.772	22	89	98.3	100/70	989
63	5-12	0.773	23	88	98.2	96/58	950
103	9-19	1.01	18	72	98.0	—	1251
103	9-20	1.01	22	68	98.2	88/56	1289
105	11-2	1.00	25	70	98.2	92/42	1178
105	11-3	1.00	22	64	98.3	88/42	1213

\* DuBois formula.  
† Systolic/Diastolic.



JIMMY

FIGURE 224. Actual size reproduction of roentgenogram of left hand.  
Chronological age 53 months.



## JIMMY

FIGURE 225. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 53 months.





JIMMY

FIGURE 226. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 53 months.



JIMMY

FIGURE 227. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 53 months.



JIMMY

FIGURE 228. Actual size reproduction of roentgenogram of left hip.  
Chronological age 53 months.



JIMMY

FIGURE 229. Actual size reproduction of roentgenogram of left knee.  
Chronological age 53 months.





## JIMMY

FIGURE 230. Actual size reproduction of roentgenogram of left knee.  
Chronological age 53 months.



## JIMMY

FIGURE 231. Actual size reproduction of roentgenogram of left foot.  
Chronological age 53 months.



JIMMY

FIGURE 232. Actual size reproduction of roentgenogram of left foot.  
Chronological age 53 months.



JIMMY

FIGURE 233. Actual size reproduction of roentgenogram of left hand.  
Chronological age 55 months.





## JIMMY

FIGURE 234. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 55 months.



JIMMY

FIGURE 235. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 55 months.



## JIMMY

FIGURE 236. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 55 months.



JIMMY

FIGURE 237. Actual size reproduction of roentgenogram of left hip.  
Chronological age 55 months.





## JIMMY

FIGURE 238. Actual size reproduction of roentgenogram of left knee.  
Chronological age 55 months.



## JIMMY

FIGURE 239. Actual size reproduction of roentgenogram of left knee.  
Chronological age 55 months.



JIMMY

FIGURE 240. Actual size reproduction of roentgenogram of left foot.  
Chronological age 55 months.



JIMMY

FIGURE 241. Actual size reproduction of roentgenogram of left foot.  
Chronological age 55 months.



TABLE 197

Jimmy  
56 months

FOOD INTAKE  
*Values in grams per day*

Food	DATE							
	10-5	11-4	12-4	1-13	2-7	3-3	3-18	3-23
	to 11-4	to 12-4	to 1-13	to 2-7	to 3-3	to 3-18	to 3-23*	to 5-12†
Apple	100	100	100	100	100	100	100	100
Ascorbic acid	—	—	.02	.02	.02	—	—	—
Banana	100	200	200	200	200	100	100	100
Beef, lean	100	100	100	100	100	100	100	100
Bread, white	20	10	60	60	60	70	70	70
Bread, whole wheat	30	30	30	30	30	30	30	30
Butter	20	20	30	30	30	30	33	33
Cabbage	25	25	25	25	25	25	25	25
Carrot	25	25	25	25	25	25	25	25
Cheese, American	15	15	15	15	15	15	15	15
Corn flakes	15	5	5	5	5	15	15	15
Egg, whole	50	50	50	50	50	50	50	50
Graham cracker	18	18	18	18	18	18	18	18
Lettuce	20	20	20	20	20	20	20	20
Milk, evaporated	—	—	—	400	400†	—	—	—
Milk, fluid	400	400	400	—	—	400†	400†	400†
Orange concentrate	50	50	50	50	50	—	—	—
Orange juice, fresh	—	—	—	—	—	50	50	50
Peanut butter	16	16	16	16	16	16	16	16
Potato	40	40	70	70	70	70	70	70
Salt	2	2	2	2	2	2	2	2
Shredded wheat	15	5	5	5	5	15	15	15
Spinach	—	—	—	—	—	100	—	—
Sugar (average)	9	6	7	9	7	10	12	10
Tomato juice	60	60	60	60	60	60	60	60
Water (average)	432	355	471	535	523	417	400	476

\* Oxalic acid, 0.7 gm., calcium (as acetate) 0.058 gm., additional.

† Irradiated. Evaporated milk diluted 1:1.

‡ Antuitrin S, 3 cc. hypodermically, April 7, 9, 12, 14, 17, 19, 22, 24.

TABLE 198

Jimmy  
57 months

PEDOMETER MEASUREMENTS

Date	Miles	Date	Miles	Date	Miles	Date	Miles	Date	Miles
11-16	3½	12-15	2½½	1-25	3⅞	2-23	4⅞	4-11	2½
11-17	3	12-21	4⅞	1-26	3½	2-29	1½	4-12	3½
11-23	2½½	12-22	2½½	2-1	3½	3-1	2½	4-18	4½
11-24	3½½	12-28	2½	2-2	3	3-7	2½	4-19	4½
11-30	3½½	12-29	2⅞	2-8	3½	3-8	2½	4-25	3
						3-14	2½	4-26	5½
12-1	2½	1-11	3½	2-9	⅞	3-28	7	5-2	5½
12-7	1⅞	1-12	2½	2-15	2½	3-29	6⅞	5-3	2½
12-8	2⅞	1-18	5½	2-16	2½	4-4	4½	5-9	4½
12-14	2½	1-19	3½	2-22	3½	4-5	2½	5-10	3

New Haven pedometers were set at 27 inches and worn hooked to belt during hours awake

BODY LENGTH AND WEIGHT—INTAKE AND ELIMINATION

Date	Recumbent length*	Weight*	INTAKE			AVERAGE DAILY HEAT OF COMBUSTION			FECES				
			AVERAGE DAILY			In-take	Urine	Feces	AVERAGE DAILY			Laxation rate†	Elimination time‡
			Dry wt. +	Total water†	Fat				Wet wt.	Dry wt. +	Fat		
mo.-day	cm.	kg.	gm.	gm.	gm.	Cal.	Cal.	Cal.	gm.	gm.	gm.		hours
10-5	107	16.83	317	1285	57.5	1630	58	41	83.6	12.0	1.2	1.6	32
10-10	107	16.86	319	1264	57.5	1640	61	50	77.0	15.0	1.4	1.8	13
10-15	107	16.88	323	1344	57.5	1655	70	65	68.6	14.0	1.3	2.4	10
10-20	107	16.85	317	1172	57.5	1629	51	64	63.2	14.0	1.4	2.2	25
10-25	107	16.83	317	1207	57.5	1630	59	62	65.4	12.0	1.2	2.2	24
10-30	107	16.82	322	1198	57.5	1651	63	73	67.4	16.0	1.7	1.8	38
11-4	107	16.85	315	1258	58.9	1638	63	62	55.6	14.0	1.3	1.8	25
11-9	107	16.87	317	1190	58.9	1644	63	56	66.4	12.0	0.9	1.8	26
11-14	107	16.88	314	1209	58.9	1633	46	65	67.8	9.0	0.9	1.8	25
11-19	107	16.89	312	1239	58.9	1626	65	50	56.8	10.0	1.0	1.6	25
11-24	108	16.86	315	1266	58.9	1638	65	62	63.0	13.0	1.3	1.2	25
11-29	108	16.86	314	1274	58.9	1631	62	50	52.0	10.0	0.9	1.8	31
12-4	108	16.96	359	1346	73.3	1879	66	58	101.6	15.0	1.3	2.2	25
12-9	108	17.11	361	1362	73.3	1887	66	82	137.8	16.0	1.7	2.0	25
12-14	108	17.27	360	1386	73.3	1885	66	64	105.4	11.0	1.2	2.6	11
12-19	108	17.37	359	1368	73.3	1882	69	72	129.0	17.0	1.6	2.6	7
12-24	108	17.46	369	1378	73.3	1919	67	58	101.6	12.0	1.2	2.0	26
12-29	108	17.52	364	1388	73.3	1899	—	68	147.0	16.0	1.3	2.6	11
###													
1-8	108	17.71	362	1526	73.3	1893	61	78	109.8	19.0	1.9	2.4	11
1-13	108	17.92	379	1268	76.6	1916	66	82	93.0	19.0	1.9	2.0	6
1-18	108	18.06	385	1204	76.6	1938	61	91	76.2	18.0	1.7	1.8	34
1-23	108	18.21	380	1361	76.6	1918	60	64	79.8	14.0	1.5	1.8	8
1-28	108	18.33	380	1236	76.6	1920	60	74	83.6	16.0	1.6	1.4	25
2-2	108	18.46	381	1161	76.6	1924	65	72	92.2	13.0	1.5	1.2	30
2-7	109	18.50	378	1230	76.6	1913	64	96	83.8	16.0	1.8	1.4	26
2-12	109	18.52	382	1171	76.6	1931	71	71	82.6	17.0	1.8	1.6	24
2-17	109	18.58	375	1252	76.6	1901	63	66	100.0	13.0	1.6	2.2	6
2-22	109	18.69	378	1262	76.6	1913	55	100	106.8	19.0	1.9	2.2	12
2-27	109	18.74	376	1262	76.6	1908	66	85	99.8	15.0	1.4	2.0	13
3-3	109	18.72	366	1371	77.0	1841	70	84	87.0	21.0	2.1	2.2	6
3-8	109	18.71	367	1347	77.0	1843	70	92	83.0	23.0	2.2	2.0	30
3-13	110	18.70	375	1394	77.0	1875	69	79	90.8	14.0	1.4	2.2	8
3-18	110	18.71	356	1272	77.5	1866	65	61	92.2	20.0	2.1	2.4	7
3-23	110	18.70	345	1301	77.5	1853	63	80	64.8	16.0	2.1	2.0	7
3-28	110	18.76	341	1296	77.5	1839	62	68	64.2	15.0	1.7	1.6	30
4-2	110	18.77	343	1256	77.5	1847	63	71	85.0	17.0	1.8	1.8	8
4-7	110	18.87	344	1281	77.5	1852	63	58	89.4	12.0	1.2	2.0	25
4-12	110	18.92	347	1241	77.5	1862	42	100	81.0	21.0	2.4	2.2	7
4-17	110	19.11	345	1285	77.5	1854	63	82	72.0	17.0	1.8	2.0	26
4-22	111	19.27	345	1302	77.5	1856	59	76	55.4	21.0	2.3	2.0	25
4-27	111	19.48	344	1471	77.5	1851	56	66	70.4	16.0	1.9	1.8	24
5-2	111	19.52	346	1451	77.5	1857	64	88	91.4	20.0	2.2	3.0	11
5-7	111	19.50	349	1681	77.5	1870	66	71	62.5	16.0	1.8	2.0	12

The age given is the initial age at start of study. Dates given are first days of five-day balance periods. Italic figures were omitted from calculations of the averages given in Volume I.  
\* See Table 190 for actual values and method of smoothing.  
+ Based on alcohol-dried food and oven-dried feces.  
† Drinking water plus water in foods.  
‡ Average number of defecations per day.  
§ Elapsed time between ingestion and defecation of marker used to separate feces of five-day periods.  
# See case history, page 634, for explanation of missing period.

TABLE 200

Jimmy  
56 monthsNITROGEN AND NEGATIVE MINERALS IN INTAKE, URINE, FECES  
*Values are averages per day*

Date	NITROGEN			PHOSPHORUS			CHLORINE			SULFUR		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
10-5	9.45	7.96	1.10	996	631	274	3031	2696	13	612	521	58
10-10	9.45	8.45	1.01	996	640	296	3031	2652	12	612	590	64
10-15	9.45	8.10	1.03	996	680	356	3031	2736	5	612	588	68
10-20	9.45	8.37	0.93	996	640	293	3031	2858	12	612	581	66
10-25	9.45	7.99	0.92	996	655	312	3031	2724	17	612	574	80
10-30	9.45	8.52	0.96	996	638	354	3031	2826	12	612	599	76
11-4	9.26	7.98	0.88	951	576	257	2924	2652	59	596	548	63
11-9	9.26	8.12	0.89	951	555	300	2924	2616	36	596	546	56
11-14	9.26	7.94	0.95	951	589	286	2924	2696	71	596	536	66
11-19	9.26	8.47	0.88	951	588	239	2924	2734	49	596	714	52
11-24	9.26	8.61	0.82	951	682	296	2924	2460	53	596	563	60
11-29	9.26	8.24	0.81	951	588	255	2924	2592	39	596	542	50
12-4	10.06	8.78	1.02	1049	603	292	3417	2981	80	668	564	69
12-9	10.06	8.59	1.28	1049	686	332	3417	3017	133	668	558	81
12-14	10.06	8.65	1.07	1049	731	261	3417	2880	39	668	562	59
12-19	10.06	9.06	1.27	1049	579	283	3417	3060	83	668	587	82
12-24	10.06	8.19	1.21	1049	571	260	3417	2940	41	668	543	60
12-29	10.06	8.40	1.16	1049	682	264	3417	2880	73	668	570	69
***												
1-8	10.06	8.20	1.05	1049	588	343	3417	2808	50	668	514	75
1-13	10.12	8.17	1.16	1122	682	328	3409	3000	48	701	565	80
1-18	10.12	8.02	1.13	1122	649	416	3409	2877	88	701	557	86
1-23	10.12	8.01	1.05	1122	613	250	3409	2934	66	701	558	64
1-28	10.12	8.05	1.08	1122	710	291	3409	3180	81	701	565	70
2-2	10.12	8.52	1.11	1122	720	286	3409	3156	73	701	585	61
2-7	10.12	7.84	1.14	1122	672	361	3409	2868	70	701	543	104
2-12	10.12	8.57	1.15	1122	762	278	3409	3000	55	701	591	72
2-17	10.12	7.84	1.15	1122	688	216	3409	2892	59	701	565	70
2-22	10.12	7.69	1.23	1122	715	340	3409	2982	91	701	545	105
2-27	10.12	8.64	1.16	1122	763	285	3409	3012	65	701	596	85
3-3	10.68	8.78	1.15	1175	753	341	3955	3768	73	726	621	65
3-8	10.68	9.16	1.18	1175	755	381	3955	3780	74	726	633	103
3-13	10.68	8.93	1.27	1175	739	288	3955	3688	45	726	603	84
3-18	10.39	8.45	1.09	1088	755	287	3418	3150	52	698	609	85
3-23	10.39	8.11	1.03	1088	688	283	3418	3054	22	698	567	78
3-28	10.39	8.74	0.97	1088	734	310	3418	3228	47	698	595	66
4-2	10.39	8.30	1.14	1088	724	292	3418	3354	59	698	560	66
4-7	10.39	8.39	1.04	1088	703	222	3418	3186	61	698	546	59
4-12	10.39	8.65	1.11	1088	736	404	3418	3090	89	698	583	96
4-17	10.39	8.15	1.10	1088	730	302	3418	2934	78	698	550	86
4-22	10.39	8.25	1.08	1088	716	306	3418	3222	59	698	564	85
4-27	10.39	7.38	1.11	1088	575	229	3418	2880	40	698	493	67
5-2	10.39	8.02	1.15	1088	634	292	3418	3264	62	698	536	91
5-7	10.39	8.41	1.04	1088	772	258	3418	2988	47	698	564	70

\* See footnotes to Table 199.

TABLE 201

Jimmy  
56 months

## POSITIVE MINERALS IN INTAKE, URINE, FECES

*Values are averages per day*

Date	CALCIUM			MAGNESIUM			SODIUM			POTASSIUM		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
10-5	722	144	577	248	65	176	1876	1709	46	2252	1924	263
10-10	722	150	497	248	68	171	1876	1680	34	2252	1850	258
10-15	722	131	491	248	56	173	1876	1790	18	2252	2000	262
10-20	722	129	459	248	70	164	1876	1808	21	2252	1872	230
10-25	722	135	453	248	67	145	1876	1854	27	2252	1840	215
10-30	722	143	461	248	66	155	1876	1794	18	2252	1990	237
11-4	724	116	477	262	55	158	1769	1622	00	2628	2269	190
11-9	724	109	482	262	70	167	1769	1574	28	2628	2160	191
11-14	724	112	464	262	59	173	1769	1606	28	2628	2174	203
11-19	724	125	481	262	68	134	1769	1638	00	2628	2300	191
11-24	724	107	521	262	57	132	1769	1632	24	2628	2410	189
11-29	724	118	521	262	81	150	1769	1631	00	2628	1987	185
12-4	757	132	463	289	77	144	2063	1901	70	2763	2201	275
12-9	757	121	577	289	57	210	2063	1821	124	2763	2229	409
12-14	757	107	502	289	25	181	2063	1793	66	2763	2300	324
12-19	757	115	520	289	86	181	2063	1885	97	2763	2410	385
12-24	757	120	537	289	32	182	2063	1886	38	2763	2250	299
12-29	757	108	557	289	82	196	2063	1896	106	2763	2320	408
***												
1-8	757	124	555	289	100	180	2063	1797	70	2763	2111	322
1-13	804	135	616	294	91	180	2155	1963	49	2775	2340	332
1-18	804	126	604	294	93	177	2155	1949	00	2775	2319	270
1-23	804	119	546	294	92	162	2155	1914	26	2775	2233	262
1-28	804	114	585	294	74	174	2155	2067	32	2775	2260	257
2-2	804	101	567	294	78	203	2155	2060	29	2775	2323	280
2-7	804	96	573	294	74	190	2155	1885	18	2775	2299	247
2-12	804	98	542	294	86	171	2155	2004	39	2775	2226	265
2-17	804	107	503	294	83	169	2155	1900	49	2775	2174	276
2-22	804	104	523	294	75	189	2155	1970	62	2775	2118	297
2-27	804	107	479	294	80	180	2155	1978	46	2775	2176	285
3-3	825	127	512	336	109	195	2545	2455	38	2785	2115	268
3-8	825	108	519	336	87	209	2545	2387	28	2785	2290	270
3-13	825	133	547	336	90	222	2545	2359	34	2785	2267	309
3-18	832	115	541	282	76	163	2169	2045	42	2676	1995	297
3-23	775	126	451	282	81	149	2169	1934	16	2676	1873	212
3-28	775	134	484	282	85	160	2169	1987	00	2676	1987	237
4-2	775	154	466	282	85	162	2169	2115	35	2676	1949	279
4-7	775	153	465	282	79	148	2169	1976	47	2676	1968	272
4-12	775	158	488	282	87	161	2169	1851	00	2676	2153	239
4-17	775	164	460	282	80	155	2169	1846	00	2676	1875	236
4-22	775	175	453	282	81	154	2169	1954	24	2676	1956	238
4-27	775	158	433	282	77	145	2169	1761	25	2676	1769	253
5-2	775	160	399	282	86	147	2169	2056	31	2676	1896	254
5-7	775	143	390	282	90	146	2169	1863	00	2676	1873	215

\* See footnotes to Table 199.



TABLE 202

Jimmy  
61 months

## NITROGEN PARTITION OF URINE

*Values in grams of nitrogen per day*

Date	Total nitrogen	Urea	Ammonia	Creatinine + Creatine	Creatinine	Uric acid
3-28	9.37	8.042	0.258	0.290	0.155	0.122
3-29	8.61	8.097	0.243	0.308	0.147	0.119
3-30	8.45	7.182	0.278	0.300	0.169	0.119
3-31	8.16	7.384	0.256	0.342	0.134	0.122
4-1	9.09	8.270	0.270	0.337	0.151	0.120
4-2	8.42	7.007	0.263	0.323	0.141	0.128
4-3	8.38	7.302	0.258	0.301	0.141	0.116
4-4	8.46	7.344	0.256	0.342	0.153	0.121
4-5	8.33	7.440	0.240	0.375	0.149	0.137
4-6	7.92	7.001	0.219	0.317	0.154	0.135
4-7	8.73	7.991	0.269	0.297	0.134	0.129
4-8	7.96	7.101	0.239	0.286	0.138	0.126
4-9	8.24	6.240	0.220	0.292	0.134	0.122
4-10	8.68	7.605	0.215	0.352	0.162	0.124
4-11	8.32	7.422	0.198	0.309	0.131	0.118
4-12	9.37	7.502	0.258	0.388	0.184	0.134
4-13	8.64	7.523	0.297	0.330	0.152	0.135
4-14	8.57	7.588	0.232	0.275	0.164	0.128
4-15	8.13	7.142	0.258	0.281	0.128	0.120
4-16	8.57	7.562	0.294	0.247	0.151	0.130
4-17	7.61	6.846	0.214	0.270	0.154	0.110
4-18	8.40	7.464	0.228	0.272	0.188	0.126
4-19	8.68	7.663	0.245	0.275	0.170	0.121
4-20	7.87	7.051	0.233	0.255	0.162	0.125
4-21	8.18	7.355	0.233	0.240	0.147	0.138
4-22	7.73	6.939	0.229	0.245	0.143	0.118
4-23	9.13	8.028	0.192	0.315	0.190	0.117
4-24	8.63	7.439	0.253	0.293	0.186	0.128
4-25	8.04	7.175	0.303	0.283	0.149	0.122
4-26	7.72	6.828	0.232	0.252	0.164	0.124
4-27	8.62	7.546	0.246	0.281	0.157	0.127
4-28	6.79	5.825	0.197	0.242	0.151	0.103
4-29	7.31	6.308	0.222	0.256	0.145	0.116
4-30	6.98	6.030	0.222	0.301	0.167	0.110
5-1	7.16	6.312	0.208	0.245	0.164	0.109
5-2	7.58	6.615	0.249	0.255	0.170	0.108
5-3	7.78	6.707	0.261	0.293	0.177	0.128
5-4	8.18	7.149	0.213	0.306	0.162	0.129
5-5	8.34	7.212	0.252	0.289	0.164	0.116
5-6	8.23	7.315	0.243	0.346	0.160	0.127
5-7	7.95	6.976	0.254	0.297	0.153	0.127
5-8	8.18	7.298	0.254	0.264	0.190	0.121
5-9	8.09	7.197	0.239	0.229	0.164	0.114
5-10	9.15	7.818	0.362	0.437	0.210	0.136
5-11	8.66	8.075	0.295	0.251	0.158	0.116

The age given is the initial age at start of study.

TABLE 203

Jimmy  
56 months

## COMPLEX CARBOHYDRATES IN INTAKE AND FECES

*Values in grams per day*

Date	LIGNIN		CELLULOSE		HEMICELLULOSE		
	Intake	Feces	Intake	Feces	INTAKE		Feces
					Total	Stable	
10-5	1.28	1.74	2.08	0.20	2.17	1.72	0.55
10-10	1.28	1.73	2.08	0.16	2.17	1.72	0.88
10-15	1.28	1.76	2.08	0.20	2.17	1.72	0.59
10-20	1.28	2.05	2.08	0.05	2.17	1.72	0.95
10-25	1.28	1.57	2.08	0.17	2.17	1.72	0.52
10-30	1.28	2.31	2.08	0.28	2.17	1.72	0.84
11-4	1.62	2.32	2.03	0.37	1.82	1.43	0.80
11-9	1.62	2.98	2.03	0.14	1.82	1.43	0.36
11-14	1.62	1.44	2.03	0.05	1.82	1.43	0.47
11-19	1.61	1.97	2.02	0.09	1.76	1.36	0.51
11-24	1.63	2.21	2.05	0.25	1.88	1.50	0.60
11-29	1.61	1.68	2.02	0.18	1.76	1.36	0.37
12-4	1.67	1.49	2.27	0.50	2.12	1.59	0.79
12-9	1.67	1.96	2.27	0.54	2.12	1.59	0.74
12-14	1.67	1.36	2.27	0.34	2.12	1.59	0.56
12-19	1.67	2.24	2.27	0.45	2.12	1.59	0.68
12-24	1.67	1.22	2.27	0.47	2.12	1.59	0.55
12-29	1.67	1.49	2.27	0.52	2.12	1.59	0.56
***							
1-8	1.67	2.46	2.27	0.78	2.12	1.59	0.74
1-13	1.67	2.40	2.27	0.58	2.12	1.59	0.84
1-18	1.66	2.43	2.25	0.71	2.06	1.52	0.82
1-23	1.67	1.51	2.27	0.56	2.12	1.59	0.50
1-28	1.67	2.07	2.27	0.58	2.12	1.59	0.78
2-2	1.67	1.48	2.27	0.47	2.12	1.59	0.61
2-7	1.67	1.67	2.27	0.47	2.12	1.59	0.70
2-12	1.67	2.03	2.27	0.63	2.12	1.59	0.77
2-17	1.67	1.58	2.27	0.52	2.12	1.59	0.55
2-22	1.67	2.21	2.27	0.79	2.12	1.59	0.80
2-27	1.67	1.64	2.27	0.59	2.12	1.59	0.67
3-3	1.46	2.00	2.61	0.81	2.61	1.98	1.20
3-8	1.46	2.32	2.61	0.75	2.61	1.98	1.12
3-13	1.46	1.37	2.61	0.40	2.61	1.98	0.69
3-18	1.33	1.57	2.32	0.75	2.47	1.89	1.00
3-23	1.33	1.48	2.32	0.69	2.47	1.89	0.97
3-28	1.36	1.54	2.37	0.81	2.65	2.09	1.08
4-2	1.33	1.43	2.32	0.81	2.47	1.89	1.03
4-7	1.33	1.25	2.32	0.41	2.47	1.89	0.64
4-12	1.33	2.27	2.32	1.06	2.47	1.89	1.20
4-17	1.33	1.73	2.32	0.65	2.47	1.89	1.02
4-22	1.33	1.85	2.32	0.81	2.47	1.89	1.28
4-27	1.33	1.71	2.32	0.52	2.47	1.89	0.96
5-2	1.33	1.81	2.32	0.55	2.47	1.89	1.05
5-7	1.33	1.43	2.32	0.70	2.47	1.89	0.96

\* See case history, page 634.

TABLE 204

Jimmy  
56 months

IRON IN INTAKE, URINE, FECES  
*Values are averages per day*

Date	Intake	Urine	Feces	Date	Intake	Urine	Feces	Date	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mo.-day	mg.	mg.	mg.	mo.-day	mg.	mg.	mg.
10-5	7.39	0.03	4.98	12-19	8.03	0.01	6.69	3-3	9.18	0.12	9.11
10-10	7.39	0.01	6.21	12-24	8.03	0.02	4.96	3-8	9.18	0.34	11.36
10-15	7.39	0.22	5.32	12-29	8.03	0.01	5.76	3-13	9.18	0.58	5.20
10-20	7.39	0.11	5.56	§§§				3-18	8.20	0.25	8.30
10-25	7.39	0.02	5.18	1-8	8.03	0.01	6.67				
10-30	7.39	0.34	7.20	1-13	8.11	0.01	7.22	3-23	8.20	0.16	7.04
11-4	7.07	0.07	6.30	1-18	8.11	0.01	6.82	3-28	8.20	0.12	6.71
				1-23	8.11	0.08	5.13	4-2	8.20	0.08	25.08
11-9	7.07	0.50	6.02	1-28	8.11	0.13	5.80	4-7	8.20	0.12	4.65
11-14	7.07	0.17	3.77	2-2	8.11	0.15	4.57	4-12	8.20	0.05	10.29
11-19	7.07	0.09	4.69								
11-24	7.07	0.01	7.17	2-7	8.13	0.08	6.04	4-17	8.20	0.04	7.86
11-29	7.07	0.00	4.58	2-12	8.13	0.10	6.20	4-22	8.20	0.00	9.29
12-4	8.03	0.00	6.02	2-17	8.13	0.08	5.07	4-27	8.20	0.06	6.68
12-9	8.03	0.00	9.34	2-22	8.13	0.22	6.32	5-2	8.20	0.10	11.28
12-14	8.03	0.00	4.51	2-27	8.13	0.11	5.10	5-7	8.20	0.15	7.22

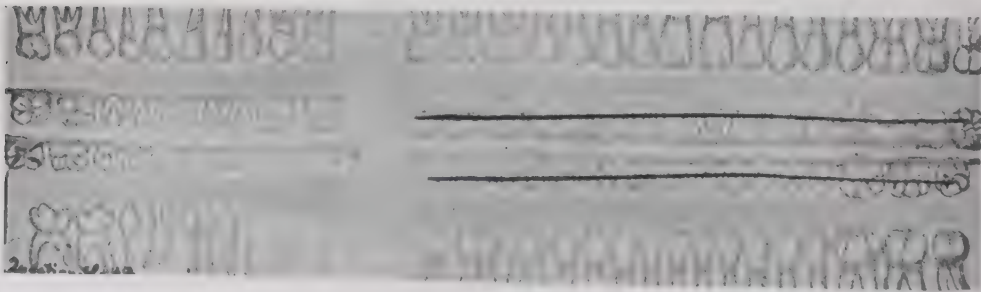
The age given is the initial age at start of study. Dates given are first days of five-day balance periods.  
§§§ See case history, page 634, for explanation for missing period.

TABLE 205

Jimmy  
61 months

TEMPERATURE AND PULSE

Date	Temper- ature	Pulse	Date	Temper- ature	Pulse	Date	Temper- ature	Pulse
4-7	98.2	92	4-19	98.4	96	5-2	98.6	100
4-8	98.6	88	4-20	98.2	89	5-3	98.6	92
4-9	98.4	84	4-21	98.2	92	5-4	98.2	88
4-10	98.2	86	4-22	98.4	84	5-5	98.3	88
4-11	98.6	84	4-23	98.2	94	5-6	98.8	88
4-12	98.3	84	4-24	98.4	96	5-7	98.2	92
			4-25	98.7	100			
4-13	98.6	84	4-26	98.2	92	5-8	98.2	86
4-14	98.4	92	4-27	98.8	90	5-9	98.2	88
4-15	98.6	96	4-28	98.6	96	5-10	98.4	84
4-16	98.2	84	4-29	98.0	84	5-11	98.4	92
4-17	98.6	88	4-30	98.2	98	5-12	98.2	88
4-18	98.0	80	5-1	98.3	100	5-13	98.6	84



JIMMY  
FIGURE 242. Dental examination, age 57 months.



JIMMY

FIGURE 243. Roentgenograms of teeth, age 58 months.



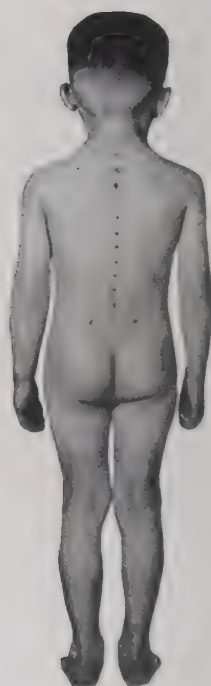
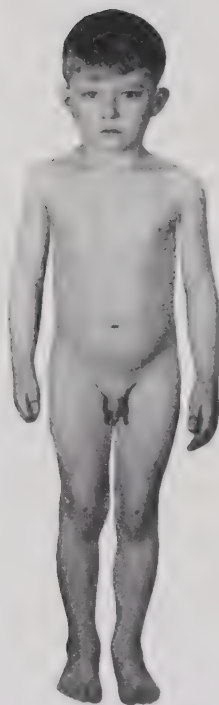
JIMMY

FIGURE 244. Actual size reproduction of roentgenogram of jaws.  
Chronological age 58 months.





FIGURE 245. JIMMY  
Age 59 months





## JIMMY

FIGURE 246. Actual size reproduction of roentgenogram of left hand.  
Chronological age 61 months.



JIMMY

FIGURE 247. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 61 months.



JIMMY

FIGURE 248. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 61 months.





## JIMMY

FIGURE 249. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 61 months.



JIMMY

FIGURE 250. Actual size reproduction of roentgenogram of left hip.  
Chronological age 61 months.



JIMMY

FIGURE 251. Actual size reproduction of roentgenogram of left knee.  
Chronological age 61 months.



## JIMMY

FIGURE 252. Actual size reproduction of roentgenogram of left knee.  
Chronological age 61 months.





JIMMY

FIGURE 253. Actual size reproduction of roentgenogram of left foot.  
Chronological age 61 months.



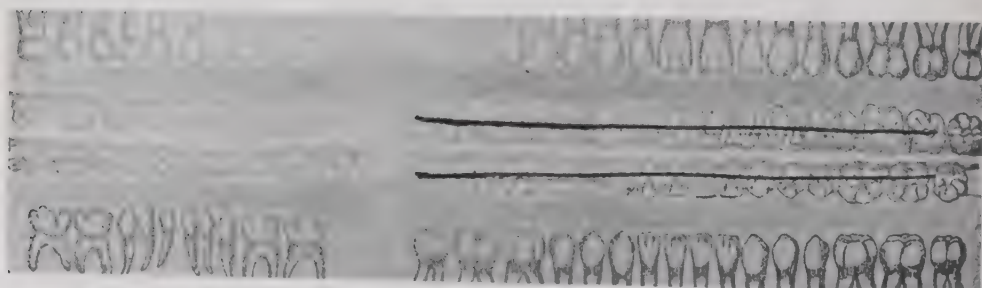
JIMMY

FIGURE 254. Actual size reproduction of roentgenogram of left foot.  
Chronological age 61 months.



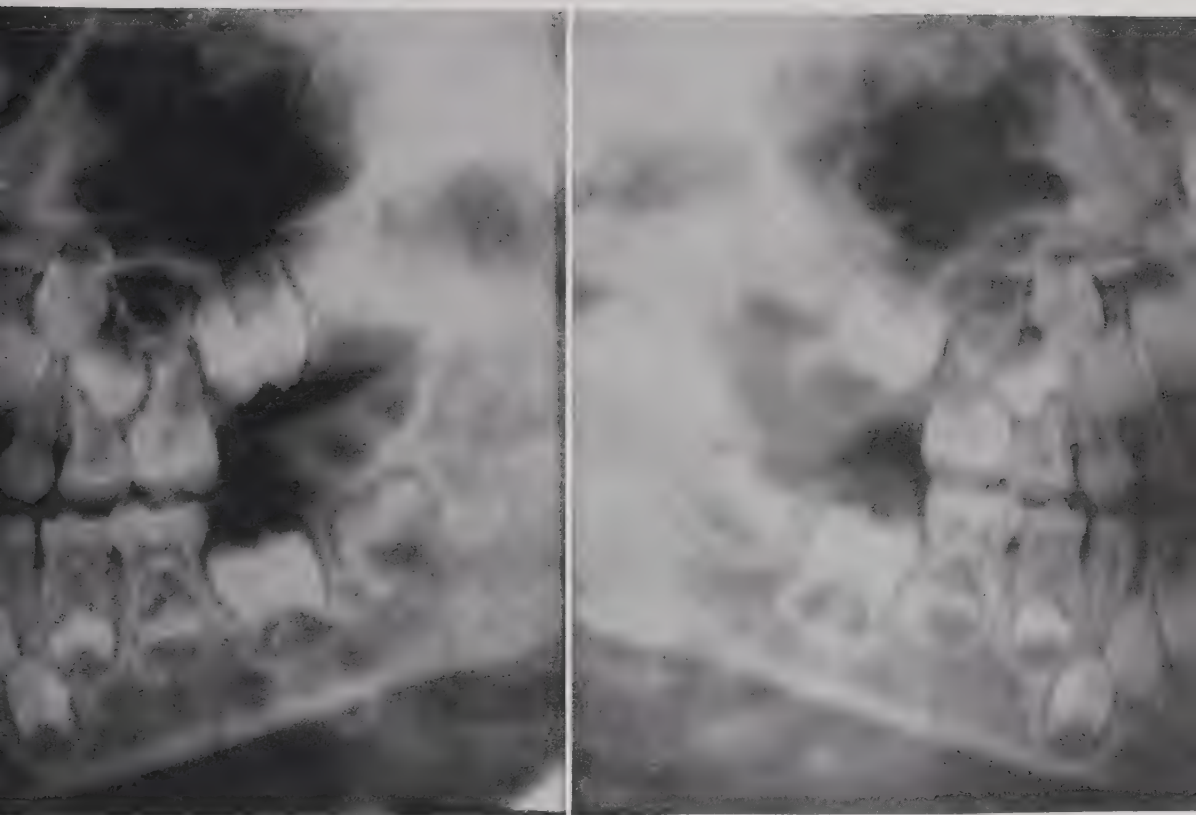
JIMMY

FIGURE 255. Roentgenograms of teeth, age 63 months.



JIMMY

FIGURE 256. Dental examination, age 63 months.



## JIMMY

FIGURE 257. Actual size reproduction of roentgenogram of jaws.  
Chronological age 63 months.





JIMMY

FIGURE 258. Actual size reproduction of roentgenogram of left hand.  
Chronological age 63 months.



## JIMMY

FIGURE 259. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 63 months.



JIMMY

FIGURE 260. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 63 months.



JIMMY

FIGURE 261. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 63 months.





JIMMY

FIGURE 262. Actual size reproduction of roentgenogram of left hip.  
Chronological age 63 months.



JIMMY

FIGURE 263. Actual size reproduction of roentgenogram of left knee.  
Chronological age 63 months.



## JIMMY

FIGURE 264. Actual size reproduction of roentgenogram of left knee.  
Chronological age 63 months.



JIMMY

FIGURE 265. Actual size reproduction of roentgenogram of left foot.  
Chronological age 63 months.





JIMMY

FIGURE 266. Actual size reproduction of roentgenogram of left foot.  
Chronological age 63 months.



## JIMMY

FIGURE 267. Actual size reproduction of roentgenogram of left hand.  
Chronological age 77 months.



JIMMY

FIGURE 268. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 77 months.



## JIMMY

FIGURE 269. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 77 months.





JIMMY

FIGURE 270. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 77 months.



JIMMY

FIGURE 271. Actual size reproduction of roentgenogram of left hip.  
Chronological age 77 months.



JIMMY

FIGURE 272. Actual size reproduction of roentgenogram of left knee  
Chronological age 77 months.



## JIMMY

FIGURE 273. Actual size reproduction of roentgenogram of left knee.  
Chronological age 77 months.





JIMMY

FIGURE 274. Actual size reproduction of roentgenogram of left foot.  
Chronological age 77 months.



JIMMY

FIGURE 275. Actual size reproduction of roentgenogram of left foot.  
Chronological age 77 months.

## ROENTGENOGRAMS OF PROGRESS OF BARIUM MEAL

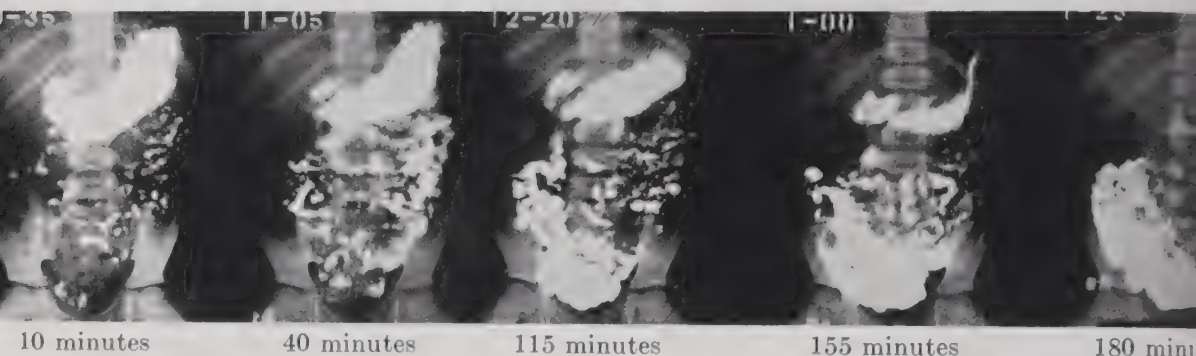


FIGURE 276. Progress of meal consisting of 2 ounces of barium sulfate and 4 ounces of standard pasteurized milk (3.5 per cent fat). The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

JIMMY  
Age, 72 months

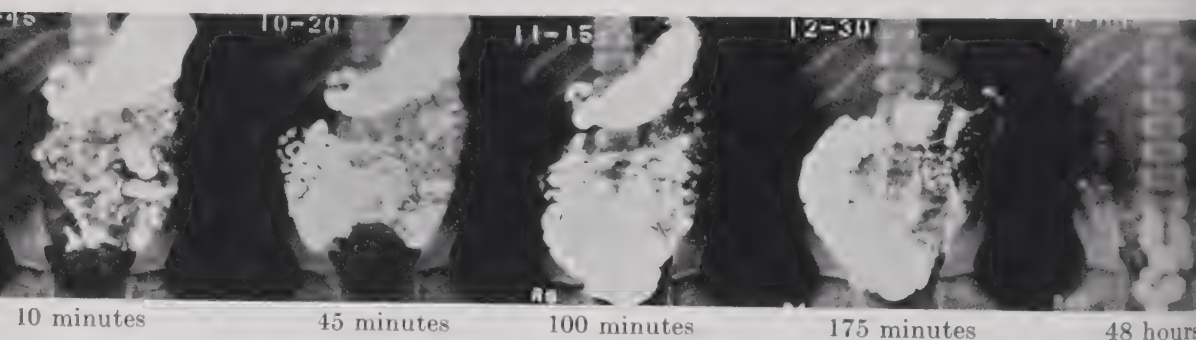


FIGURE 277. Progress of meal consisting of 2 ounces of barium sulfate, 3 ounces of water and 1 ounce of corn syrup (approximately 30 per cent glucose, 61 per cent carbohydrate). The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

JIMMY  
Age, 72 months

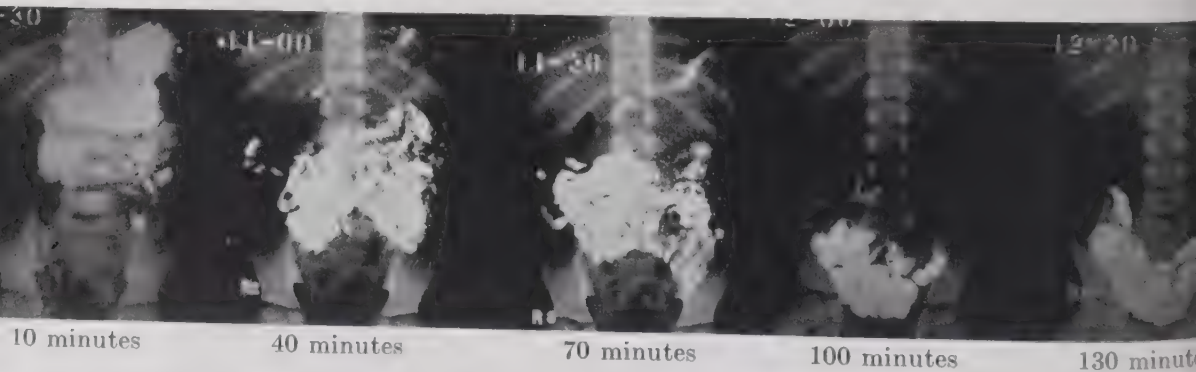
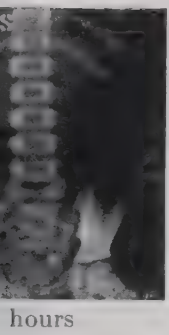
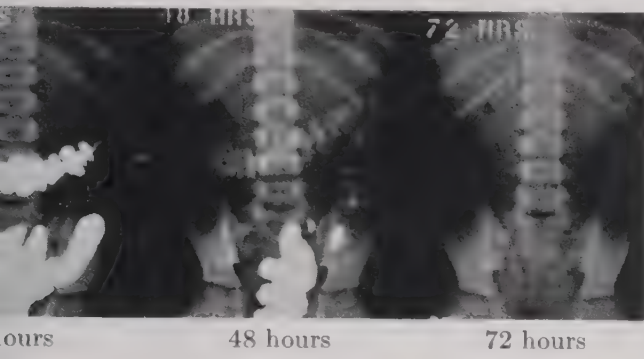


FIGURE 278. Progress of meal consisting of 2 ounces of barium sulfate and 4 ounces of water. The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

JIMMY  
Age, 72 months

LS THROUGH GASTROINTESTINAL TRACT





## ROENTGENOGRAMS OF PROGRESS OF BAR

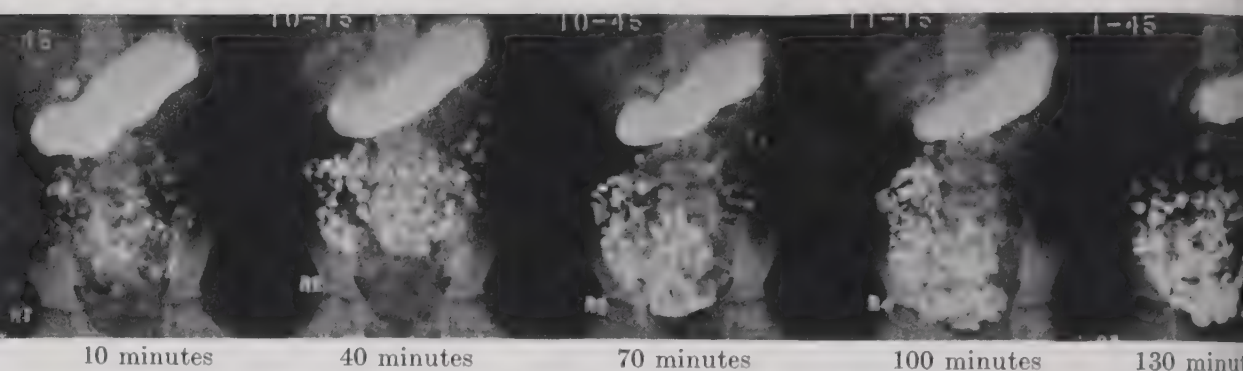


FIGURE 279. Progress of meal consisting of 40 grams of barium sulfate mixed with 100 grams of raw, ground lean meat, baked twenty to thirty minutes and ingested with 200 ml. of water. In the 290 gm. of barium, meat and water ingested (about 50 gm. of water were lost in cooking) the concentrations of fat and protein were approximately 3.5 and 7 per cent, respectively.

JIMMY  
Age, 72 months

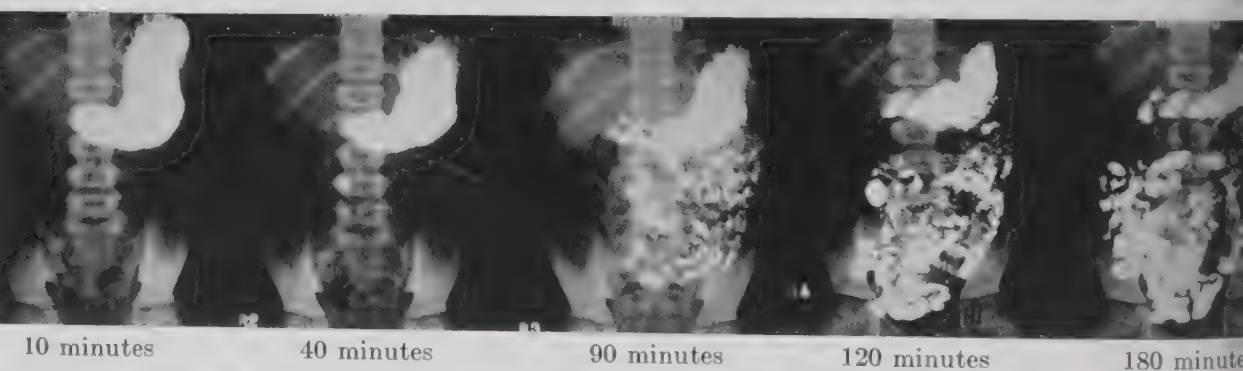


FIGURE 280. Progress of meal consisting of 2 ounces of barium sulfate and 4 ounces of standard pasteurized milk (3.5 per cent fat). The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

JIMMY  
Age, 92 months

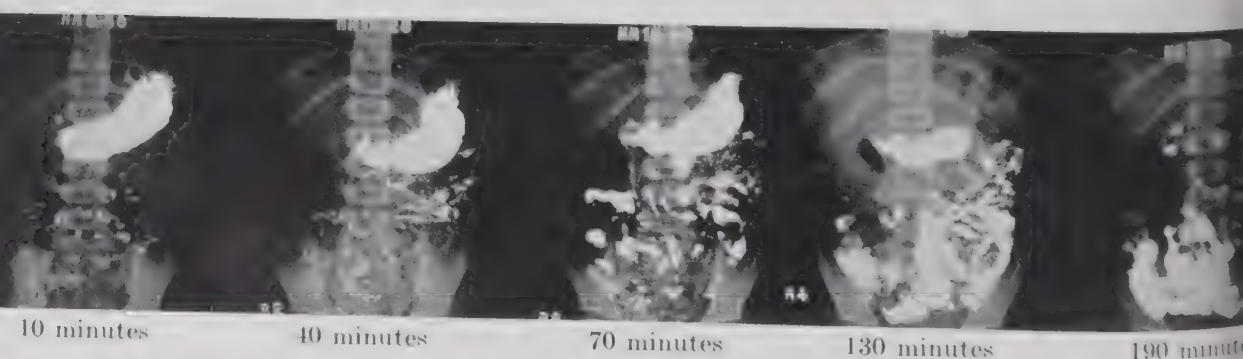
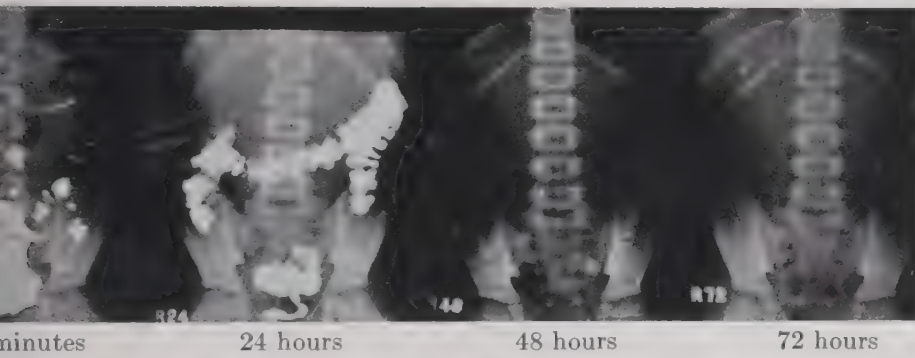
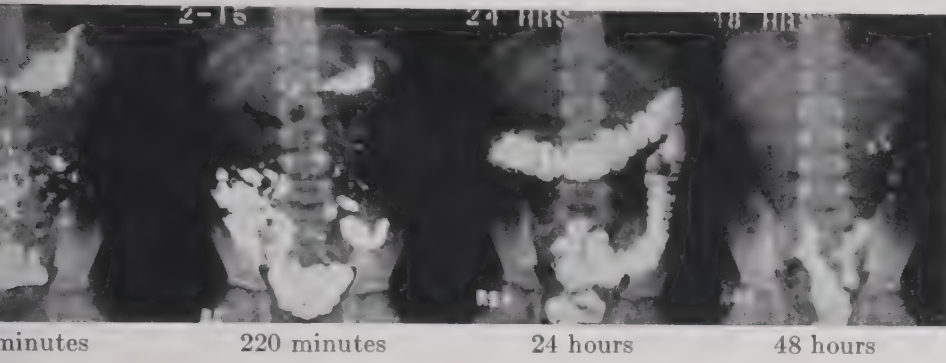


FIGURE 281. Progress of meal consisting of 2 ounces of barium sulfate, 4 ounces of standard pasteurized milk and 0.2-0.3 gm. carmine. The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

JIMMY  
Age, 92 months

THROUGH GASTROINTESTINAL TRACT



## ROENTGENOGRAMS OF PROGRESS OF BARIUM MEAL

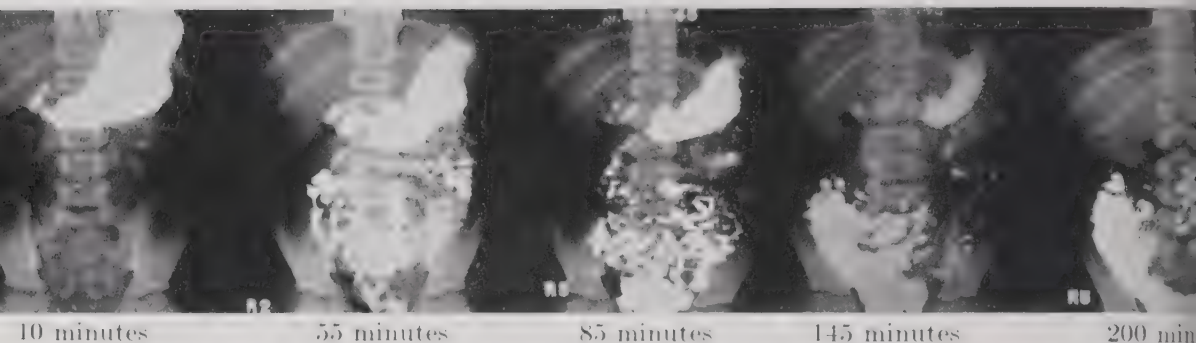


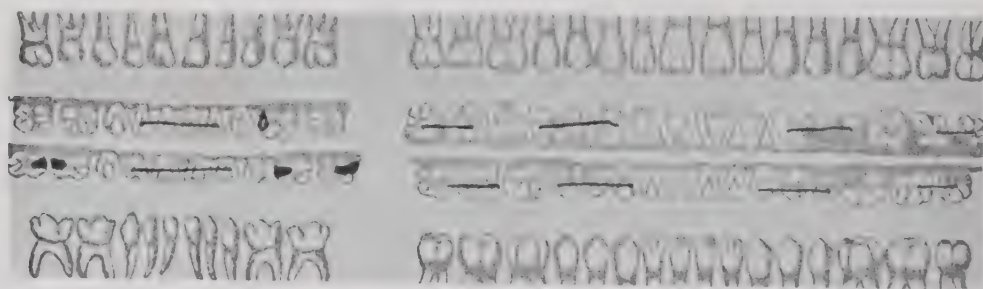
FIGURE 282. Progress of meal consisting of 2 ounces of barium sulfate and 4 ounces of evaporated milk, diluted 1:1 with water. The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

JIMMY  
Age, 92 months



FIGURE 283. Progress of meal consisting of 2 ounces of barium sulfate and 4 ounces of base-exchanged milk. The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

JIMMY  
Age, 92 months



JIMMY

FIGURE 284. Dental examination, age 105 months.



THROUGH GASTROINTESTINAL TRACT

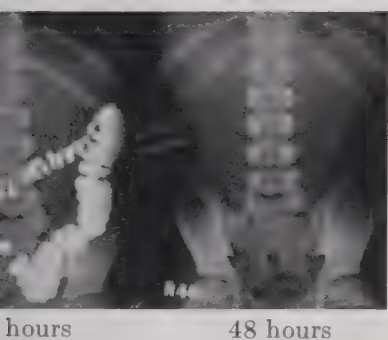
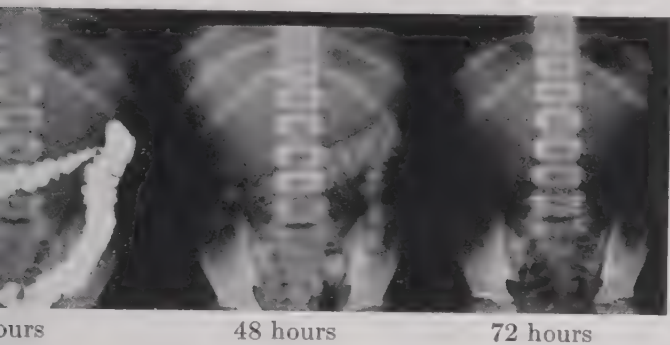




TABLE 206

Jimmy  
103 monthsFOOD INTAKE  
*Values in grams per day*

Food	DATE	Food	DATE	Food	DATE
	9-18 to 11-12		9-18 to 11-12		9-18 to 11-12
Apple	100	Cheese, American	20	Orange juice, canned	100
Banana	150	Corn flakes	30	Peanut butter	16
Beef, lean	100	Egg, whole	100	Peas, quick frozen	25
Bread, white	50	Gelatin	3	Potato	60
Bread, whole wheat	50	Graham cracker	36	Salt	2
Butter	30	Honey	15	Sugar (average)	22
Cabbage	25	Lettuce	25	Tomato juice	60
Carrot	50	Milk, fluid, irradiated	500	Water (average)	557

TABLE 207

Jimmy  
103 months

## BODY LENGTH AND WEIGHT—INTAKE AND ELIMINATION

Date	Recumbent length*	Weight*	INTAKE			AVERAGE DAILY HEAT OF COMBUSTION			FECES				
			AVERAGE DAILY						AVERAGE DAILY			Lax- ation rate†	Elim- ination time§
			Dry wt.+	Total water†	Fat	In- take	Urine	Feces	Wet wt.	Dry wt.+	Fat		
mo.-day	cm.	kg.	gm.	gm.	gm.	Cal.	Cal.	Cal.	gm.	gm.	gm.		hours
9-18	132	27.54	410	1913	78.5	2086	91	86	77.8	17.9	2.4	1.6	26
9-23	132	26.93	403	1719	80.5	2068	92	94	81.6	19.0	2.7	1.8	35
9-28	132	27.12	445	1647	88.1	2273	91	104	89.6	21.0	2.8	1.6	50
10-3	132	26.84	410	1702	83.4	2099	90	80	61.6	16.9	2.4	1.4	36
10-8	132	27.14	427	1749	84.2	2170	86	94	89.2	19.1	2.6	1.6	31
10-13	132	26.80	416	1707	83.0	2136	90	86	61.6	17.6	2.6	1.2	54
10-18	132	26.94	468	1576	84.2	2344	90	86	74.6	17.6	2.5	1.2	36
10-23	132	27.18	460	1656	83.0	2312	93	94	77.6	19.6	2.4	1.2	36
10-28	132	27.10	432	1675	80.5	2167	91	98	94.6	20.2	2.4	1.2	12
11-2	132	27.11	415	1691	82.7	2139	94	92	80.8	18.9	2.3	1.4	12
11-7	132	27.23	433	1627	82.1	2194	91	87	69.0	18.2	2.9	1.2	35

The age given is the initial age at start of study. Dates given are first days of five-day balance periods.  
 \* See Table 190 for actual values and method of smoothing.

† Based on vacuum-dried food and cryochem-dried feces. Corresponding values for alcohol-dried food and oven-dried feces are given in Table 597, page 1421.

‡ Drinking water plus water in foods.

§ Average number of defecations per day.

§ Elapsed time between ingestion and defecation of marker used to separate feces of five-day periods.

TABLE 208

Jimmy  
103 monthsNITROGEN AND NEGATIVE MINERALS IN INTAKE, URINE, FECES  
*Values are averages per day*

Date	NITROGEN			PHOSPHORUS			CHLORINE			SULFUR		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
9-18	12.69	11.20	1.12	1437	1058	373	4403	4150	30	984	774	104
9-23	12.47	11.51	1.22	1455	1004	389	4325	3992	26	933	866	108
9-28	13.05	11.04	1.33	1432	974	359	4376	4119	32	1011	750	123
10-3	13.54	11.57	1.03	1488	1004	333	4312	4152	20	965	806	102
10-8	12.86	11.14	1.13	1429	970	373	4141	3951	33	1032	756	102
10-13	13.18	11.24	0.98	1492	965	371	4270	4062	14	868	773	87
10-18	13.05	11.20	1.00	1492	982	378	4471	4253	21	1006	774	104
10-23	13.45	11.58	1.11	1494	992	433	4414	4173	28	1058	836	110
10-28	13.14	11.08	1.32	1413	943	382	4275	4052	33	924	776	117
11-2	13.26	11.36	1.14	1450	958	394	4426	3919	27	944	792	108
11-7	13.00	11.17	1.02	1522	944	359	4315	4268	18	983	753	100

TABLE 209

Jimmy  
103 monthsPOSITIVE MINERALS IN INTAKE, URINE, FECES  
*Values are averages per day*

Date	CALCIUM			MAGNESIUM			SODIUM			POTASSIUM		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
9-18	928	178	620	284	98	177	3032	2702	17	3256	3108	266
9-23	961	218	661	299	101	175	2966	2671	24	3170	3119	286
9-28	914	151	600	277	101	174	3053	2722	15	3176	2708	267
10-3	944	158	554	305	103	152	3043	2726	9	3252	2838	216
10-8	907	201	555	282	109	172	2950	2576	32	3252	2566	254
10-13	940	198	537	305	104	160	3052	2685	6	3268	2735	218
10-18	933	196	574	294	103	171	3002	2782	13	3266	2971	234
10-23	944	178	627	293	107	187	2974	2730	11	3293	2904	252
10-28	932	187	556	281	105	174	3008	2738	43	3230	2767	279
11-2	961	180	587	284	106	169	2980	2621	18	3277	2804	288
11-7	995	177	547	296	108	163	2909	2841	7	3332	2797	238

TABLE 210

Jimmy  
103 months

COMPLEX CARBOHYDRATES IN INTAKE AND FECES  
*Values in grams per day*

Date	LIGNIN		CELLULOSE		HEMICELLULOSE		
	Intake	Feces	Intake	Feces	INTAKE		Feces
					Total	Stable	
9-18	1.25	0.98	2.74	0.68	2.80	1.61	0.58
9-23	1.25	1.04	2.74	0.76	2.80	1.61	0.69
9-28	1.25	1.43	2.74	0.83	2.80	1.61	0.70
10-3	1.25	1.15	2.74	0.73	2.80	1.61	0.61
10-8	1.25	1.11	2.74	0.81	2.80	1.61	0.56
10-13	1.25	1.03	2.74	0.36	2.80	1.61	0.68
10-18	1.25	1.14	2.74	0.76	2.80	1.61	0.54
10-23	1.25	1.23	2.74	0.76	2.80	1.61	0.67
10-28	1.25	1.54	2.74	0.72	2.80	1.61	0.66
11-2	1.25	1.30	2.74	0.74	2.80	1.61	0.61
11-7	1.25	1.40	2.74	0.61	2.80	1.61	0.74

The age given is the initial age at start of study. Dates given are first days of five-day balance periods.

TABLE 211

Jimmy  
103 months

FAT PARTITION OF FECES  
*Values in grams per day*

Date	Unsaponi- fiable	Neutral fat	Free fatty acids	Soap
9-18	0.74	0.28	0.22	1.18
9-23	0.95	0.23	0.27	1.29
9-28	0.93	0.40	0.25	1.19
10-3	0.79	0.25	0.21	0.12
10-8	0.80	0.35	0.28	1.13
10-13	0.94	0.38	0.25	1.07
10-18	0.86	0.24	0.25	1.15
10-23	0.92	0.31	0.26	0.96
10-28	0.86	0.42	0.29	0.87
11-2	0.83	0.27	0.26	0.94
11-7	0.83	0.40	0.28	1.37

TABLE 211A

Jimmy  
103 months

CARBON IN INTAKE, URINE, FECES  
*Values in grams per day*

Date	Intake	Urine	Feces	Date	Intake	Urine	Feces
9-18	189.8	8.4	8.0	10-18	189.8	9.2	7.6
9-23	189.8	8.8	8.6	10-23	189.8	8.9	8.6
9-28	189.8	8.4	9.1	10-28	189.8	8.6	9.1
10-3	189.8	8.6	7.4				
10-8	189.8	8.5	8.3	11-2	189.8	8.8	8.3
10-13	189.8	8.5	7.9	11-7	189.8	8.2	8.1

TABLE 212

Jimmy  
103 months

## TITRABLE ACIDITY AND ORGANIC ACID IN URINE

*Values in milliequivalents per day*

Date	Titration acidity	pH	Total organic acid	Date	Titration acidity	pH	Total organic acid
9-18	17.6	6.23	29.9	10-16	19.0	6.32	27.2
9-19	22.8	6.08	29.6	10-17	14.0	6.62	29.8
9-20	27.8	5.90	34.8	10-18	17.9	6.36	28.7
9-21	18.6	6.50	27.7	10-19	19.2	6.41	31.6
9-22	22.5	6.27	28.5				
9-23	23.1	6.30	30.8	10-20	17.0	6.50	34.0
				10-21	18.0	6.40	29.4
9-24	16.8	6.40	26.2	10-22	14.3	6.52	28.7
9-25	22.0	6.17	28.2	10-23	18.6	6.40	30.0
9-26	23.0	5.80	29.7				
9-27	21.2	6.19	30.5	10-24	16.0	6.53	32.2
9-28	23.3	5.93	30.7	10-25	18.9	6.41	29.1
9-29	18.0	6.32	30.8	10-26	17.2	6.40	28.1
				10-27	16.0	6.46	32.3
9-30	20.0	6.24	27.0				
10-1	16.6	6.54	32.2	10-28	14.8	6.53	28.0
10-2	11.4	6.82	28.8	10-29	19.2	6.23	26.3
10-3	19.9	6.38	30.0	10-30	16.8	6.33	40.0
10-4	16.5	6.44	27.2	10-31	17.9	6.38	32.2
10-5	20.3	6.30	34.4	11-1	8.6	6.70	36.0
10-6	9.1	6.60	21.9	11-2	16.9	6.32	30.0
10-7	24.0	6.40	38.8	11-3	15.4	6.36	32.4
10-8	15.4	6.50	32.0	11-4	21.4	6.20	28.2
10-9	15.2	5.30	31.3	11-5	11.6	6.56	25.6
10-10	20.5	6.32	31.7	11-6	15.2	6.46	27.4
10-11	20.6	6.27	27.8	11-7	14.8	6.53	29.1
10-12	20.6	6.48	27.4	11-8	24.2	6.00	38.0
10-13	16.0	6.69	29.2	11-9	14.6	6.44	29.8
10-14	18.1	6.47	30.4	11-10	12.5	6.55	28.2
10-15	17.9	6.48	26.0	11-11	16.3	6.46	28.2

The age given is the initial age at start of study.

TABLE 213

Jimmy  
103 months

## SALIVA CULTURE ESTIMATION OF CARIES ACTIVITY

Date	QUANTITATIVE*			QUALITATIVE†	COLOR REACTION TEST‡			
	Lacto- bacilli	Cocci	Yeast		hours after preparation			
					24	48	72	96
mo.-day	colonies per ml. of saliva							
9-22	0	0	0	+	0	0	4	4
10-23	30,000	1800	0	+	0	2	4	4
10-31	72,000	0	0	+	0	2	4	4
11-7	18,000	0	0	+	0	0	3	4
11-14	240,000	0	160	+	1	4	4	4

\* 0.2 ml. saliva to tomato agar plate.

† 1.0 ml. saliva in acid glucose broth.

‡ 0.2 ml. saliva into melted beef agar.



TABLE 214

Jimmy  
103 months

## NITROGEN PARTITION OF URINE

*Values in grams of nitrogen per day*

Date	Urine volume	Total nitrogen	Urea	Ammonia	Creatinine + Creatine	Creatinine	Uric acid
9-18	835	10.437	8.873	0.323	0.333	0.223	0.136
9-19	1055	11.159	9.519	0.374	0.392	0.236	0.131
9-20	1105	11.620	9.919	0.385	0.344	0.257	0.176
9-21	1105	11.463	9.887	0.344	0.404	0.234	0.103
9-22	655	10.744	9.499	0.301	0.344	0.218	0.163
9-23	990	12.506	10.942	0.398	0.397	0.236	0.172
9-24	670	11.068	9.255	0.295	0.359	0.227	0.147
9-25	675	11.512	9.786	0.324	0.359	0.211	0.165
9-26	970	11.839	9.434	0.370	0.343	0.225	0.167
9-27	640	10.788	9.535	0.315	0.305	0.240	0.187
9-28	665	11.150	9.601	0.329	0.289	0.213	0.158
9-29	805	11.774	9.974	0.322	0.318	0.234	0.140
9-30	715	11.018	9.565	0.315	0.306	0.236	0.122
10-1	748	10.560	9.274	0.336	0.276	0.214	0.098
10-2	688	10.712	9.494	0.356	0.324	0.234	0.130
10-3	678	10.949	9.661	0.349	0.346	0.227	0.115
10-4	630	11.446	10.137	0.323	0.332	0.216	0.127
10-5	850	11.740	10.442	0.382	0.331	0.224	0.140
10-6	430	7.551	6.683	0.197	0.267	0.170	0.111
10-7	1130	15.393	14.130	0.514	0.422	0.315	0.155
10-8	520	10.097	8.890	0.310	0.281	0.227	0.128
10-9	625	11.166	9.771	0.329	0.334	0.222	0.117
10-10	1175	11.928	10.516	0.404	0.335	0.228	0.145
10-11	905	10.884	9.638	0.358	0.298	0.216	0.126
10-12	1050	11.596	10.173	0.370	0.342	0.219	0.155
10-13	1150	11.704	10.279	0.347	0.330	0.234	0.137
10-14	755	11.692	10.481	0.289	0.310	0.210	0.123
10-15	895	10.968	9.880	0.296	0.272	0.198	0.128
10-16	1028	10.868	9.351	0.321	0.296	0.234	0.127
10-17	1030	11.245	9.982	0.314	0.276	0.211	0.141
10-18	950	10.824	9.608	0.316	0.273	0.210	0.129
10-19	800	11.506	10.320	0.295	0.289	0.242	0.131
10-20	747	10.776	9.476	0.284	0.310	0.229	0.127
10-21	905	11.604	10.404	0.324	0.338	0.245	0.138
10-22	1000	11.518	9.519	0.309	0.328	0.248	0.135
10-23	890	11.143	9.731	0.323	0.326	0.231	0.118
10-24	940	11.423	10.070	0.322	0.327	0.229	0.126
10-25	767	11.365	9.956	0.374	0.320	0.227	0.134
10-26	815	12.361	10.771	0.350	0.376	0.242	0.133
10-27	727	11.607	10.126	0.324	0.334	0.219	0.130
10-28	775	11.196	9.792	0.318	0.334	0.208	0.143
10-29	825	11.088	9.786	0.342	0.320	0.238	0.135
10-30	985	10.966	9.567	0.369	0.312	0.225	0.151
10-31	850	11.096	9.779	0.361	0.300	0.240	0.117
11-1	1010	10.930	9.606	0.318	0.300	0.226	0.122
11-2	940	11.342	9.956	0.388	0.293	0.238	0.128
11-3	960	11.986	10.509	0.351	0.333	0.257	0.146
11-4	985	11.472	10.086	0.366	0.327	0.250	0.130
11-5	865	11.158	9.809	0.300	0.321	0.224	0.130
11-6	740	10.784	9.216	0.314	0.315	0.236	0.137
11-7	1120	11.323	8.002	0.398	0.276	0.235	0.115
11-8	865	10.952	9.097	0.341	0.309	0.241	0.127
11-9	947	10.991	9.864	0.344	0.294	0.215	0.123
11-10	865	11.191	9.902	0.350	0.321	0.234	0.125
11-11	1108	11.242	10.056	0.332	0.331	0.245	0.138

The age given is the initial age at start of study. Urine volumes are in milliliters.

TABLE 215

Jimmy  
103 months

## VOLUME, WEIGHT AND SULFUR PARTITION OF URINE

*Values are averages per day*

Date	Volume	Specific gravity	Wet weight	Dry weight*	SULFUR PARTITION		
					Inorganic	Ethereal	Neutral
mo.-day	ml.		gm.	gm.	mg.	mg.	mg.
9-18†	951	1.021	971	45.9	—	—	—
9-23†	789	1.028	811	47.2	—	—	—
9-28†	724	1.030	746	45.6	660	37	53
10-3†	744	1.031	767	47.2	704	32	70
10-8†	855	1.036	886	45.3	664	40	52
10-13†	972	1.028	999	47.0	666	46	61
10-18†	880	1.025	902	48.3	670	46	58
10-23†	828	1.029	852	48.4	703	46	87
10-28†	889	1.030	916	46.0	662	45	69
11-2†	898	1.029	924	46.2	682	42	68
11-7†	981	1.022	1003	46.8	—	—	—
11-7‡	—	—	—	—	674	40	44
11-8‡	—	—	—	—	673	46	78
11-9‡	—	—	—	—	663	54	121
11-10‡	—	—	—	—	650	54	72
11-11‡	—	—	—	—	689	44	55

\* Cryochem dried.

† Determined upon five-day composites and corrected for precipitate solubility.

‡ Determined upon daily urine collections and corrected for precipitate solubility.

TABLE 216

Jimmy  
103 months

## COPPER, ZINC, MANGANESE IN INTAKE, URINE, FECES

*Values are averages per day*

Date	COPPER*			ZINC*			MANGANESE		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake†	Urine *	Feces†
mo.-day	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
9-18	4.30	0.26	1.71	13.85	0.64	11.16	1.99	0.003	2.07
9-23	3.84	0.22	1.73	15.72	0.26	8.82	1.90	0.001	2.12
9-28	5.30	0.26	1.75	15.38	0.36	9.60	2.18	0.003	2.23
10-3	4.49	0.47	1.86	15.47	0.42	9.05	2.00	0.000	1.95
10-8	4.52	0.39	2.07	14.26	0.56	7.97	2.22	0.008	2.25
10-13	4.43	0.38	1.56	16.27	0.61	8.67	2.13	0.019	2.14
10-18	5.86	0.32	1.84	14.88	0.61	7.31	2.36	0.006	2.04
10-23	6.21	0.24	2.23	16.34	0.51	11.64	2.25	0.005	2.44
10-28	5.02	0.35	1.84	15.37	0.56	11.40	2.31	0.005	2.17
11-2	5.00	0.24	2.05	17.44	0.53	13.00	2.01	0.006	2.21
11-7	4.71	0.24	1.73	14.29	0.26	11.23	2.11	0.003	1.91

The age given is the initial age at start of study. Dates given are first days of five-day balance periods.

\* Determined polarographically.

† Determined chemically.

TABLE 217

Jimmy  
103 months

## NICKEL IN INTAKE, URINE, FECES\*

*Values are averages per day*

Date	Intake	Urine	Feces	Date	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mo.-day	mg.	mg.	mg.
9-18	1.183	0.018	0.437	10-18	1.524	0.021	0.470
9-23	0.899	0.000	0.454	10-23	1.632	0.017	0.423
9-28	0.963	0.011	0.599	10-28	0.980	0.017	0.505
10-3	1.035	0.006	0.443				
10-8	1.438	0.000	—	11-2	0.873	0.018	0.493
10-13	0.527	0.000	0.390	11-7	1.165	0.026	0.296

The age given is the initial age at start of study. Dates given are first days of five-day balance periods. Italic figures were omitted from calculations of averages given in Volume I.

\* Determined polarographically.

TABLE 218

Jimmy  
103 monthsIRON, MANGANESE, COPPER, ALUMINUM, LEAD, TIN  
IN INTAKE, FECES\**Values in milligrams per day*

Date	IRON		MANGANESE		COPPER	
	Intake	Feces	Intake	Feces	Intake	Feces
9-18	10.94	—	2.00	—	2.64	—
9-23	10.28	8.12	1.82	1.72	2.22	1.68
9-28	9.80	8.52	2.22	2.21	4.24	1.86
10-3	12.53	7.57	1.98	2.04	3.65	1.50
10-8	14.04	8.46	2.22	1.97	3.52	1.81
10-13	11.49	7.28	2.12	2.04	3.50	1.50
10-18	12.18	9.30	2.14	2.17	6.11	1.87
10-23	12.48	11.79	2.18	2.38	4.14	2.11
10-28	11.05	8.84	2.13	2.15	4.60	1.96
11-2	10.26	8.78	1.76	2.18	2.38	1.71
11-7	9.03	9.02	1.77	1.99	2.76	1.76

	ALUMINUM		LEAD		TIN	
	Intake	Feces	Intake	Feces	Intake	Feces
9-18	4.40	—	0.58	—	1.33	—
9-23	3.80	1.92	0.56	0.36	1.52	1.18
9-28	2.85	2.94	0.52	0.28	1.79	1.41
10-3	3.38	2.35	0.52	0.26	3.32	1.74
10-8	2.43	1.71	0.62	0.34	1.54	1.73
10-13	1.98	1.59	0.45	0.25	0.92	1.00
10-18	3.50	2.48	0.67	0.26	0.77	1.04
10-23	2.71	2.47	0.62	0.40	0.72	0.75
10-28	3.02	2.10	0.52	0.28	0.70	0.58
11-2	3.24	2.30	0.66	0.69	0.75	0.66
11-7	2.14	2.54	0.52	0.30	0.76	0.65

\* Determined spectrographically by the method of Brody, James K. and Ewing, D. T. Spectrographic determination of some metallic elements in food and feces. Indus. Engin. Chem. (Anal. Ed.) 17:627, 1945.



JIMMY

FIGURE 285. Actual size reproduction of roentgenogram of left hand.  
Chronological age 103 months.





JIMMY

FIGURE 286. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 103 months.



JIMMY

FIGURE 287. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 103 months.

**JIMMY**

FIGURE 288. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 103 months.



JIMMY

FIGURE 289. Actual size reproduction of roentgenogram of left hip.  
Chronological age 103 months.





## JIMMY

FIGURE 290. Actual size reproduction of roentgenogram of left knee.  
Chronological age 103 months.



## JIMMY

FIGURE 291. Actual size reproduction of roentgenogram of left knee.  
Chronological age 103 months.



JIMMY

FIGURE 292. Actual size reproduction of roentgenogram of left foot.  
Chronological age 103 months.



JIMMY

FIGURE 293. Actual size reproduction of roentgenogram of left foot.  
Chronological age 103 months.



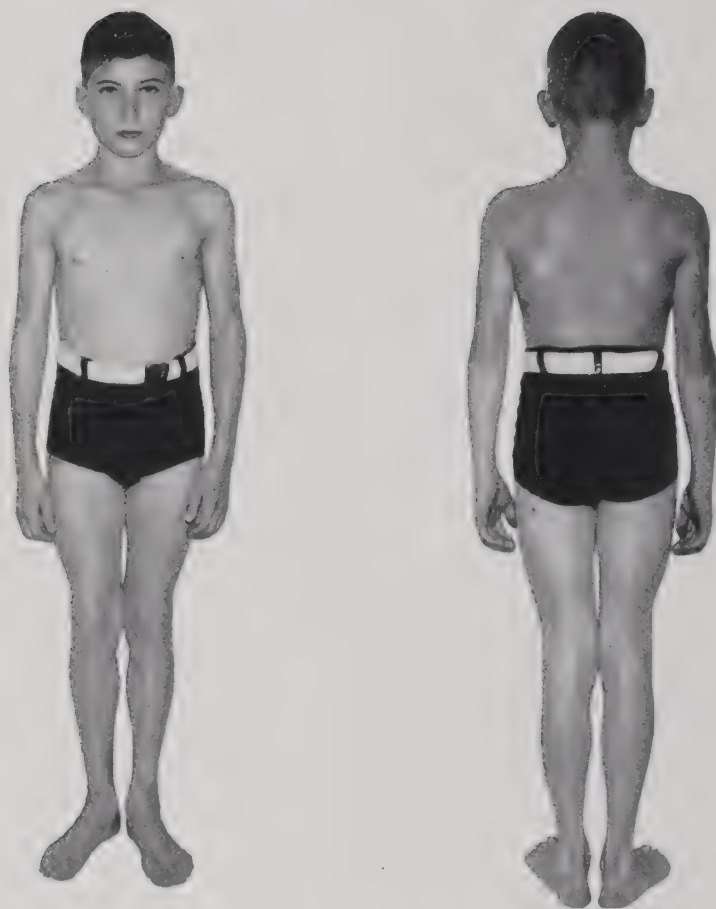


FIGURE 294. JIMMY, age 140 months.



JIMMY

FIGURE 295. Actual size reproduction of roentgenogram of left hand.  
Chronological age 140 months.

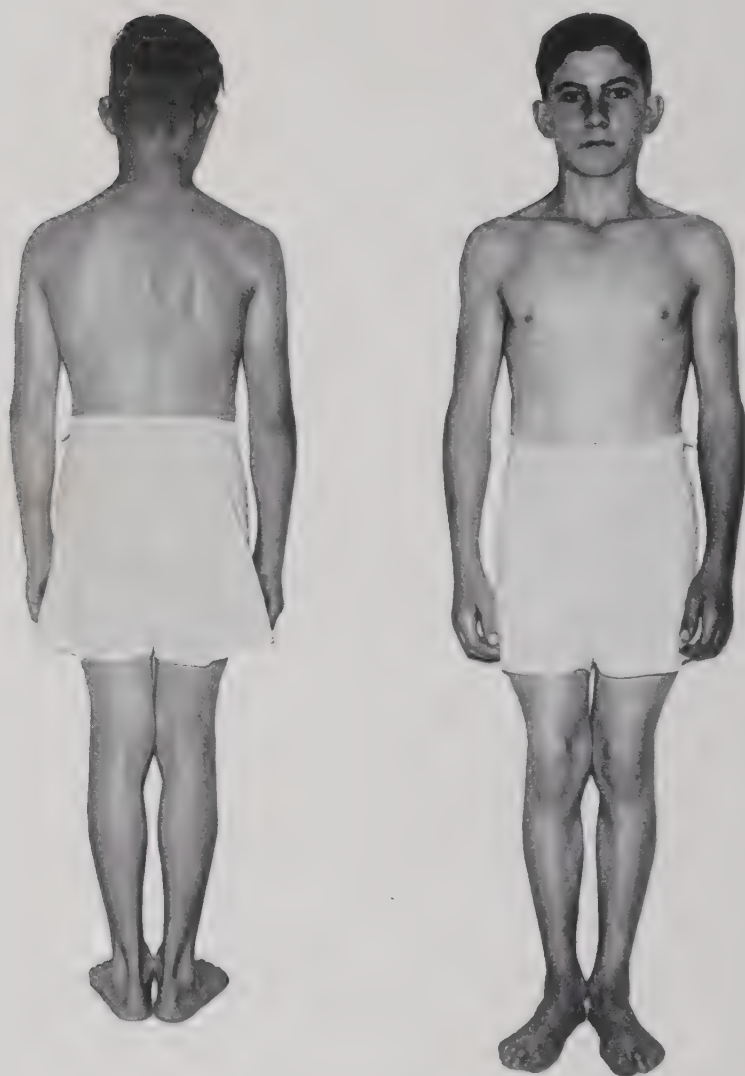


FIGURE 296. JIMMY, age 163 months.



JIMMY

FIGURE 297. Actual size reproduction of roentgenogram of left hand.  
Chronological age 163 months.





FIGURE 297A. JIMMY, age 163 months.

## BARBARA

Barbara's father was the twelfth child of Scotch parents who lived their entire lives in Cape Breton, Nova Scotia. Of thirteen children, eleven lived to adulthood. Barbara's father left school after completing the sixth or seventh grade and joined the army when he was sixteen years old. In service he was wounded in the knee and mildly shell-shocked.

Barbara's maternal grandfather was born in Abbington, Scotland; the grandmother in Cape Breton. Her mother was the second of three children, all girls. Barbara's parents were married in Cape Breton after a short courtship. At that time the father was 28 and the mother 20 years old. Their first child was a boy; Barbara was born approximately two years later. The parents separated when she was six months old.

### Medical History

Barbara weighed 5 pounds, 9 ounces, when born, following a normal pregnancy and delivery. She was bottle-fed, walked at 10 months, talked at 15 months and was toilet trained by 18 months. Dentition started at six months. Her history prior to placement in the Village shows no illnesses of any severity.

Barbara was 63 months old when she joined the group of children cooperating in the experimental studies. September 25, five days before Study II was started, Barbara fell sick of whooping cough and did not enter the study group until October 2. October 15 she remained in bed with a pain in her right side and a sick stomach. The following day she had a slight cough but no cold. November 18, Barbara was in bed with a severe cough. She remained in bed with a slight cold the next two days. January 1, she vomited her supper, coughed severely and her temperature rose to 101.4°. The following day examination by the pediatrician showed a respiratory infection but only a few hoarse râles in the chest. She was given creosote and terpin hydrate and kept in bed. By January 8 she was much improved and only an occasional coarse râle could be detected on auscultation. April 22 and 23 Barbara regurgitated her evening meal. The vomitus was recovered, analyzed and the values considered as excreta.

The record of pediatric examination at the conclusion of Study

II stated: "Barbara has been in excellent health and made excellent progress in weight and height. Tissue nutrition is excellent, also. Physical examination entirely negative." Six months later the pediatrician noted: "Gain continues at a satisfactory rate. No recurrence of respiratory infection. Examination negative."

Following Study II Barbara has lived with her mother except for the period in which she returned to the Village to participate in the third study. Frequent pediatric examinations during the intervening years were entirely negative. Three months preceding Study III her tonsils were removed and a routine recovery followed.

### Psychological

Barbara was given her first psychological examination when she was 65 months old. On the Stanford-Binet her M.A. was 74 months, I.Q. 114; on the Arthur Point Scale her M.A. was 73 months, I.Q. 112; and the Goodenough test showed an M.A. of 60 months, I.Q. 92.

Barbara was very shy when she first came to the examination room and was reluctant to respond to the tests, especially the verbal ones. After several non-verbal tests had been presented to her, she became more friendly and by the end of the time was very talkative. She seemed to enjoy the problems presented to her and to get a good deal of satisfaction from her own success as well as from the praise of the examiner. She has pretty good judgment as to her own abilities and limitations for a child of her age. She works deliberately; she is a little slow in comprehending a new problem but soon grasps it well. She likes to talk about the things she is doing. She concentrates her attention very well for a child of her age.

On the whole, Barbara shows superior intellectual capacity in dealing with both language, abstract and concrete problems. On the Binet test her scatter was a little wider than usual, which indicates instability and also detracts from the reliability of the results. Her basal age is year 4. She failed one test at year 5, one of form perception; she failed other more difficult tests of this type also. Her best response was one of abstract generalization, giving similarities, a test at year 8. She succeeded with the rote memory tests through year 6. The Arthur Point Scale is too difficult for most five year old children to comprehend, but Barbara was able to achieve some success with all the problems seen. Her picture of a man was at the low-range average level and so was inferior in comparison to her ability to deal with other



types of problems. Here again her comparatively low ability in perception of form was demonstrated.

Barbara was reexamined three years later by the same psychologist. Her chronological age was 99 months. On the Revised Stanford-Binet Scale, Form L, her M.A. was 110 months, I.Q. 111.

Barbara was examined in a clinic room of the Administration Building at the Village. She was very friendly toward the examiner and was enthusiastic about coming for this special examination. She did not recall the previous examination three years ago. Toward the end of the period she remarked that she didn't think these things were hard although Donald had told her they would be hard.

Barbara continues to be a very attractive little girl. She has blond curly hair and a fair complexion, with sparkling eyes and a sweet smile. She is outgoing in her nature and was very cooperative in the examination. She said that she has been living at home with her mother and brother, the brother being 10 years old and in the 4th grade at school. She seems to like living in the Village again and said she wished she could stay there a whole year. When asked about her play interests, Barbara said that she loves to read and would rather read than play outdoors. When asked what she had been doing that morning while she was not in school, she finally remembered that she had spent some time playing with paper dolls. She seems to enjoy school very much and says that arithmetic is the only hard subject.

Barbara cooperated very well throughout the examination. Her attention was somewhat uneven and she found it easier to concentrate on visual material than on auditory material. She reacts quickly. She has a good deal of self-confidence, she has a good awareness of her own abilities and limitations since she did not give many wrong answers or make incorrect statements, but would say she did not know the answer.

### Endocrinological

Barbara was 69 months old when classified by the endocrinologist, from the medical history, growth records, basal metabolism, physical examination and the roentgenograms of hip, shoulder, knee, elbow, foot and hand.

Gain of 1.6 inches since August 28, a period of 7 months. Normal increment for this time and age is 1.4 inches. This increase is from 0.5 inch below minimal normal to 0.1 inch below minimal normal. None of the deciduous teeth has exfoliated. Some separation of the incisors, especially. Skin of the extremities shows slight infiltration.



*Roentgenographic Study for Osseous Development*

Wrist: All carpal bones are normally present. Same is true of the epiphyses of the metacarpals and phalanges. Proximal epiphysis of the ulna, which normally appears at six, is faintly visible.

Knee: The patella and the distal epiphyses of the femur, tibia, and fibula are normally present and developed for age.

Elbow: Head of the humerus is normally present, and the proximal epiphysis of the radius, which normally appears at five, is present and normally developed.

Diagnosis: Normal osseous development.

Classification: Hypopituitarism (dwarfism) though the only evidence suggesting this is the slight decreased statural height below the minimal normal.

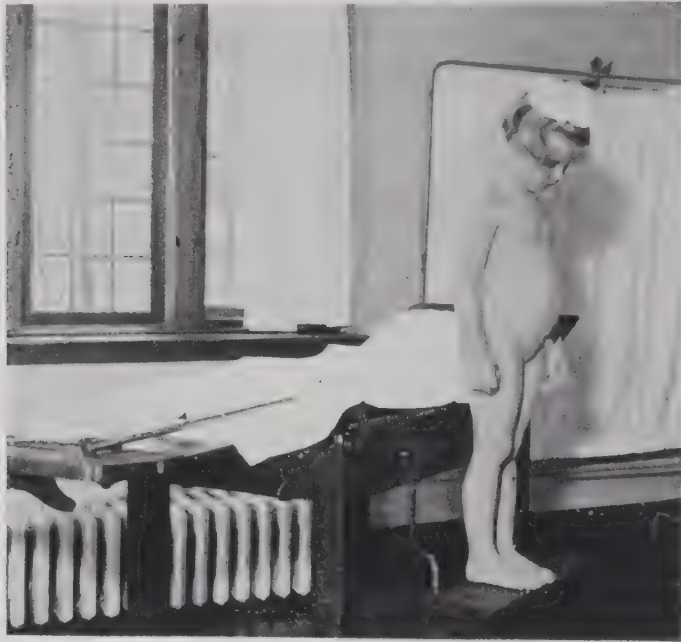


FIGURE 298. BARBARA, age 67 months.

TABLE 219

Barbara

## RECUMBENT LENGTH AND WEIGHT

Age	RECUMBENT LENGTH		Weight	Age	RECUMBENT LENGTH		Weight
	Total	Stem			Total	Stem	
mo.-days	cm.	cm.	kg.	mo.-days	cm.	cm.	kg.
62-27	102.5	—	15.88	69-1	108.6	62.2	—
63-9	—	—	15.93	69-5	—	—	18.75
63-14	—	—	16.11	69-8	—	—	18.89
63-19	—	—	16.11	69-9	108.9	62.2	—
63-25	—	—	16.24	69-13	108.6	62.5	—
63-29	—	—	16.33	69-15	—	—	18.85
64-2	104.1	59.7	—	69-19	108.9	62.2	18.65
				69-24	—	—	18.85
64-4	—	—	16.70	69-27	108.9	61.6	—
64-7	—	—	16.67				
64-14	—	—	16.83	70-1	108.6	62.2	18.70
64-17	—	—	16.80	70-4	—	—	18.90
64-19	105.4	61.0	—	70-6	109.2	62.2	—
64-22	—	—	16.82	70-9	—	—	18.97
65-0	—	—	17.00	70-12	109.2	61.9	—
				70-15	—	—	19.05
65-4	—	—	17.15	70-19	109.2	62.2	—
65-6	106.0	61.0	—				
65-7	—	—	17.10	71-20	109.9	62.0	18.73
65-14	—	—	17.37	72-22	110.7	61.0	19.16
65-16	106.0	61.0	—	73-27	111.2	64.6	18.75
65-18	—	—	17.45	74-25	110.0	61.3	18.27
65-23	—	—	17.45	75-25	111.0	62.5	18.29
				77-0	112.2	62.2	19.05
65-26	106.4	61.0	—	77-28	112.5	61.2	19.48
65-27	—	—	17.39				
66-3	—	—	17.62	81-3	114.7	64.3	19.07
66-7	—	—	17.50	84-2	—	—	19.28
66-10	107.0	61.6	—	84-24	116.9	66.2	20.41
66-13	—	—	17.30	99-1	121.9	69.0	23.81
66-17	—	—	16.85	106-22	127.0	68.4	25.29
				110-20	—	—	26.51
66-22	106.7	61.0	—	110-25	—	—	26.75
66-23	—	—	17.67				
66-28	—	—	17.50	111-1	—	—	27.21
67-2	—	—	17.60	111-6	131.0	72.0	27.46
67-7	—	—	17.69	111-9	131.0	72.3	—
67-12	—	—	17.90	111-11	130.9	72.1	27.86
67-13	106.7	61.0	—	111-13	131.4	72.7	—
				111-15	131.1	72.1	28.06
67-17	—	—	18.02	111-20	—	—	28.32
67-22	—	—	18.10				
67-24	107.6	61.6	—	111-26	—	—	29.08
68-0	—	—	18.45	112-1	—	—	29.14
68-4	—	—	18.35	112-5	—	—	29.38
68-8	—	—	18.40	112-11	131.9	73.9	29.64
68-14	—	—	18.42	112-12	131.3	73.8	—
				112-13	132.2	74.3	—
68-15	108.2	62.2	—	112-15	131.4	73.2	—
68-19	—	—	18.62	112-16	131.9	73.4	—
68-24	—	—	18.57	112-17	—	—	29.76
68-27	108.2	62.5	—	147-18	154.2	84.4	42.73
68-29	—	—	18.60	168-23	156.4	85.0	48.53

Actual values are averages of independent measurements by two workers. In calculating the smooth values given with the balance data the actual values given above were smoothed by three-point averaging and the resulting figures entered for their respective balance periods. Values for balance periods intervening between measurements were obtained by interpolation.

TABLE 220

Barbara

## ANTHROPOMETRIC MEASUREMENTS

*Values in centimeters*

Age*	BREADTH			LENGTH		WIDTH	
	Biacro-mial	Intertro- chanteric	Inter- cristal	Tibia	Head	Chest	Head
64	20.2	19.3	17.8	20.9	16.4	16.7	13.6
65	20.2	18.8	17.0	21.8	16.5	17.0	13.6
66	20.2	19.6	17.8	22.0	16.5	17.4	13.6
68	20.1	19.4	17.7	22.0	16.5	16.8	13.4
68	20.5	19.6	18.1	22.3	16.6	17.0	13.5
69	20.8	20.0	18.0	23.4	16.6	17.0	13.5
70	20.8	19.5	18.4	23.0	16.4	17.4	13.8
72	21.2	20.0	18.0	23.0	16.8	17.5	13.5
73	21.8	19.8	17.3	23.0	16.4	17.2	13.5
74	21.3	19.3	17.3	23.7	16.5	17.0	13.8
75	21.7	19.7	16.8	23.2	16.5	17.2	13.5
76	21.8	19.4	17.2	23.5	16.5	16.2	13.5
77	22.0	20.0	17.3	23.6	16.4	17.2	13.7
78	22.3	20.0	17.2	23.4	16.6	16.5	13.7
81	22.0	20.0	17.4	25.1	16.5	17.2	14.0
84	22.0	20.3	18.2	25.0	16.7	17.8	13.7
99	24.3	—	19.5	26.5	16.6	19.8	14.0
107	24.3	22.7	19.2	33.6	16.6	19.7	14.0
111	25.2	—	20.0	29.2	16.8	19.6	14.3
112	24.9	—	20.0	28.2	17.0	19.6	14.2
112	25.3	—	20.5	29.0	16.8	20.5	14.0
148	33.4	28.9	23.7	40.3	17.0	23.6	14.2
169	36.2	30.4	25.5	40.4	17.5	24.6	14.8

Age*	DEPTH	CIRCUMFERENCES				
	Chest	Head	Chest	Thigh	Abdomen	Upper arm
64	13.0	48.2	50	30	51	15.5
65	13.2	48.3	50	30	47	15.6
66	13.2	48.5	53	30	51	16.0
68	13.5	48.3	52	32	50	15.8
68	12.9	48.8	51	32	49	16.0
69	13.0	49.0	53	33	52	16.4
70	13.0	48.7	51	33	49	17.0
72	13.2	49.0	52	33	50	16.3
73	13.0	49.0	52	32	51	17.0
74	12.6	48.6	52	31	49	16.0
75	12.5	48.5	51	31	48	15.5
76	12.6	48.5	52	30	47	16.0
77	12.6	49.0	52	32	48	16.0
78	13.0	49.0	51	32	51	16.3
81	13.5	49.0	52	32	51	15.5
84	13.0	49.3	53	31	48	16.0
99	14.3	49.5	56	35	55	17.0
107	14.0	49.7	59	37	56	18.0
111	14.0	50.4	60	38	52	17.5
112	14.3	50.5	57	40	60	19.0
112	14.2	51.5	62	41	60	19.5
148	16.7	51.9	66	48	68	21.6
169	16.4	52.3	63	51	68	23.8

\* Months.

MEASUREMENTS OF THE BONES OF THE WRIST

AGE, months	63	68	70	84	110	148	169
CARPALS							
AREA, sq. mm.							
Hamate	66	73	78	90	135	185	206
Capitate	89	104	112	140	189	262	305
Lesser Multangular	22	30	33	50	97	102	135
Greater Multangular	8	18	22	53	105	161	161
Navicular	6	14	18	37	92	206	218
Lunate	13	23	24	42	79	137	139
Triangular	29	37	39	56	106	137	138
Pisiform					22	80	103
GREATEST DIAMETER, mm.							
Hamate	11	12	12	14	18	21	21
Capitate	13	14	15	18	21	24	25
Lesser Multangular	6	7	8	10	12	12	12
Greater Multangular	4	6	6	10	13	17	17
Navicular	4	5	5	8	13	22	23
Lunate	5	6	6	8	11	17	18
Triangular	7	8	8	10	14	16	17
Pisiform					7	11	12
Epiphyses							
1st Metacarpal	7	8	8	9	10	13	13
2nd Metacarpal	7	8	8	8	9	13	14
3rd Metacarpal	7	7	8	8	9	13	14
4th Metacarpal	6	6	7	7	8	11	12
ULNA							
DIAMETER, mm.							
Distal epiphysis	1	4	5	10	15	16	16
Distal metaphysis	11	11	11	12	14	15	16
RADIUS							
DIAMETER, mm.							
Distal epiphysis	16	16	17	19	22	27	29
WRIST AREA,* sq. mm.	903	968	962	992	1178	1428	1502

\* Measured with the planimeter using Flory's landmarks (Monographs of the Society for Research in Child Development, Vol. I, No. 3, 1936).

SKELETAL MATURATION  
*Values in months*

Chrono-logical age	HAND			FOOT	ELBOW	KNEE	HIP	SHOULDER	AVERAGE
	B.B.G.*	Flory†	Todd‡	Todd‡	Todd‡	Todd‡	Todd‡	Todd‡	Todd‡
63	56	38	63	63	56	60	60	51	58
68	62	48	68	69	61	69	72	53	64
70	69	53	70	71	65	70	75	57	68
84	89	71	86	80	75	84	75	87	81
110	142	101	117	123	123	123	119	115	120
148	153	126	163	—	—	—	177	—	—
169	< 204	138	184	—	—	—	—	—	—

\* Baldwin, B. T., Busby, L. M., Garside, H. V. Anatomic growth of children. University of Iowa Studies in Child Welfare, vol. 4, no. 1, 1928. (No standards over 204 months.)  
† Flory, C. D. Osseous development in the hand as an index of skeletal development. Monographs of the Society for Research in Child Development, vol. 1, no. 3, 1936.  
‡ Determined by T. Wingate Todd, C. C. Francis and Idell Pyle, Western Reserve University, Cleveland.



TABLE 223

Barbara

## HEIGHT AND WEIGHT RECORD\*

Age	Height	Weight	Age	Height	Weight	Age	Height	Weight
months	inches	pounds	months	inches	pounds	months	inches	pounds
65	41 $\frac{1}{4}$	39 $\frac{1}{4}$	74	43 $\frac{1}{2}$	41 $\frac{3}{4}$	99	48 $\frac{1}{4}$	50 $\frac{1}{4}$
66	41 $\frac{1}{2}$	39 $\frac{3}{4}$	77	43 $\frac{3}{4}$	42 $\frac{3}{4}$	110	51	56 $\frac{3}{4}$
70	42 $\frac{3}{4}$	43	78	44	43 $\frac{1}{2}$			

\* Clinical. See also table of recumbent lengths and weights.

TABLE 224

Barbara

## BASAL METABOLISM MEASUREMENTS

Age	Date	Sur- face area*	Respi- ration	Pulse rate	Body temper- ature	Blood pres- sure	Basal metab- olism
months	mo.-day	sq.m.	per min.	per min.	°F	S/D†	Cal./24 hr.
63	10-12	0.673	32	—	—	—	886
64	10-30	0.687	24	82	—	—	938
65	11-16	0.698	17	84	98.3	90/66	878
65	12-3	0.706	15	91	99.0	100/70	874
66	12-13	0.711	13	90	98.6	95/62	878
66	12-23	0.716	15	88	98.7	98/64	883
66	1-6	0.716	19	82	98.3	100/64	830
67	1-18	0.719	20	77	98.6	101/66	830
67	2-8	0.723	21	84	99.0	98/62	866
68	2-19	0.731	21	88	98.8	102/66	830
68	3-11	0.740	19	84	98.2	90/72	890
69	3-23	0.742	23	94	98.4	92/68	893
69	3-27	0.746	21	84	98.6	94/62	878
69	4-4	0.750	21	80	98.1	100/69	840
69	4-8	0.749	21	80	98.0	98/64	878
70	4-14	0.749	21	88	98.4	98/72	869
70	4-22	0.748	24	86	98.4	100/72	833
70	4-26	0.746	24	92	98.6	100/72	821
70	5-1	0.753	28	86	98.2	96/72	864
70	5-7	0.755	23	88	98.6	98/68	864
71	5-14	0.755	24	80	98.6	102/62	871
111	9-21	0.978	20	80	98.6	92/56	1305
111	9-22	0.978	19	78	98.8	94/60	1384
112	10-31	1.03	15	80	98.6	96/60	1304
112	11-1	1.03	16	86	98.4	100/58	1243

\* DuBois formula.

† Systolic/Diastolic.

TABLE 225

Barbara

## BLOOD DETERMINATIONS

Age	Date	Red cells	Hemo-globin	WHITE BLOOD CELLS						
				Total	Poly-morpho-nuclears	Lym-pho-cytes	Mono-cytes	Eosino-philés		
months	mo.-day	millions	gm./100 cc.	per c. mm.	per cent	per cent	per cent	per cent		
63	10-5	4.82	12†	12250	74	21	5	0		
68	3-12	5.10	12†	10150	41	35	12	11		
70	5-11	4.82	11†	10000	46	39	12	3		
*71	5-18	4.76	12†	—	—	—	—	—		
*110	9-13	4.66	13‡	3600§	44	52	0	4		
71	5-18	Hematocrit		RED BLOOD CELL MEASUREMENTS						
				Volume	Weight	Diameter	Thickness			
		per cent	c.μ	μg.	μ	μ				
		42	88	97	7.2	2.2				
		MINERALS (mg. per 100 ml.)								
		SERUM					ERYTHROCYTES			
		Cal-cium	Phos-phorus	So-dium	Potas-sium	Chlor-ine	So-dium	Potas-sium	Chlor-ine	
		12.9	7.54	328	15.4	364	26	468	176	
		110	9-13	11.5	3.70	—	—	—	—	—
		PLASMA NITROGEN AND LIPID (mg. per 100 ml.)								
71	5-18	Nitro-gen	Total lipid	Phos-pholipid	Neutral fat	CHOLESTEROL				
						Total	Free	Esters		
		1226	388	113	93	119	28	154		
ERYTHROCYTE NITROGEN AND LIPID (mg. per 100 gm.)										
71	5-18	5380	404	233	30	124	99	42		
71	5-18	Red blood cells total solids: 35.2 per cent by weight. Specific gravity: whole blood, 1.05; plasma, 1.02; red cells, 1.10.								

\* Venous blood.

† Haden-Hauser hemoglobinometer.

‡ Evelyn photoelectric colorimeter.

§ Heparin added.



BARBARA

FIGURE 299. Actual size reproduction of roentgenogram of left hand.  
Chronological age 63 months.



BARBARA

FIGURE 300. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 63 months.





## BARBARA

FIGURE 301. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 63 months.



BARBARA

FIGURE 302. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 63 months.



BARBARA

FIGURE 303. Actual size reproduction of roentgenogram of left hip.  
Chronological age 63 months.



## BARBARA

FIGURE 304. Actual size reproduction of roentgenogram of left knee.  
Chronological age 63 months.





## BARBARA

FIGURE 305. Actual size reproduction of roentgenogram of left knee.  
Chronological age 63 months.



## BARBARA

FIGURE 306. Actual size reproduction of roentgenogram of left foot.  
Chronological age 63 months.



BARBARA

FIGURE 307. Actual size reproduction of roentgenogram of left foot.  
Chronological age 63 months.

TABLE 226

Barbara  
63 monthsFOOD INTAKE  
*Values in grams per day*

Food	DATE							
	10-5 to 11-4	11-4 to 12-4	12-4 to 1-13	1-13 to 2-7	2-7 to 3-3	3-3 to 3-18	3-18 to 3-23*	3-23 to 5-12†
Apple	100	100	100	100	100	100	100	100
Ascorbic acid	—	—	.02	.02	.02	—	—	—
Banana	100	200	200	200	200	100	100	100
Beef, lean	100	100	100	100	100	100	100	100
Bread, white	20	10	10	10	10	20	20	20
Bread, whole wheat	30	30	30	30	30	30	30	30
Butter	20	20	20	20	20	20	23	23
Cabbage	25	25	25	25	25	25	25	25
Carrot	25	25	25	25	25	25	25	25
Cheese, American	15	15	15	15	15	15	15	15
Corn flakes	15	5	5	5	5	15	15	15
Egg, whole	50	50	50	50	50	50	50	50
Graham cracker	18	18	18	18	18	18	18	18
Lettuce	20	20	20	20	20	20	20	20
Milk, evaporated	—	—	—	400	400†	—	—	—
Milk, fluid	400	400	400	—	—	400†	400†	400†
Orange concentrate	50	50	50	50	50	—	—	—
Orange juice, fresh	—	—	—	—	—	50	50	50
Peanut butter	16	16	16	16	16	16	16	16
Potato	40	40	40	40	40	40	40	40
Salt	2	2	2	2	2	2	2	2
Shredded wheat	15	5	5	5	5	15	15	15
Spinach	—	—	—	—	—	100	—	—
Sugar (average)	4	2	4	5	8	9	8	8
Tomato juice	60	60	60	60	60	60	60	60
Water (average)	363	341	444	406	487	440	400	421

\* Oxalic acid, 0.7 gm., and calcium (as acetate) 0.058 gm., additional.

† Irradiated. Evaporated milk diluted 1:1.

‡ Antuitrin G, 5 cc. hypodermically, April 7, 9, 12, 14, 17, 19, 22, 24.

TABLE 227

Barbara  
65 months

## PEDOMETER MEASUREMENTS

Date	Miles	Date	Miles	Date	Miles	Date	Miles	Date	Miles
11-16	1 $\frac{1}{2}$	12-21	$\frac{1}{4}$	1-25	$\frac{1}{2}$	3-1	1 $\frac{1}{2}$	4-11	1 $\frac{1}{2}$
11-17	1 $\frac{1}{2}$	12-22	$\frac{1}{4}$	1-26	$\frac{1}{2}$	3-7	1 $\frac{1}{2}$	4-12	3 $\frac{1}{2}$
11-23	1	12-28	$\frac{1}{2}$	2-1	$\frac{1}{2}$	3-8	1 $\frac{5}{16}$	4-18	1 $\frac{1}{2}$
11-24	2 $\frac{3}{16}$	12-29	$\frac{1}{4}$	2-2	$\frac{3}{16}$	3-14	2 $\frac{1}{16}$	4-19	2
11-30	$\frac{7}{16}$	1-4	$\frac{1}{4}$	2-8	$\frac{1}{4}$	3-21	3 $\frac{1}{2}$	4-25	$\frac{3}{4}$
12-1	1 $\frac{5}{16}$	1-5	$\frac{3}{16}$	2-9	1 $\frac{3}{16}$	3-22	1 $\frac{1}{2}$	4-26	1 $\frac{1}{2}$
12-7	1 $\frac{1}{2}$	1-11	$\frac{1}{2}$	2-15	$\frac{1}{2}$	3-28	2 $\frac{3}{16}$	5-2	2
12-8	1 $\frac{1}{2}$	1-12	$\frac{1}{4}$	2-16	$\frac{3}{16}$	3-29	2 $\frac{1}{2}$	5-3	1 $\frac{1}{2}$
12-14	$\frac{11}{16}$	1-18	$\frac{1}{4}$	2-29	1 $\frac{1}{2}$	4-4	1 $\frac{3}{4}$	5-9	4 $\frac{1}{2}$
12-15	$\frac{1}{16}$	1-19	$\frac{1}{16}$			4-5	1 $\frac{1}{2}$	5-10	2 $\frac{1}{2}$

New Haven pedometers were set at 24 inches and worn hooked to belt during hours awake.



## BODY LENGTH AND WEIGHT—INTAKE AND ELIMINATION

Date	Recumbent length*	Weight*	INTAKE			AVERAGE DAILY HEAT OF COMBUSTION			FECES				
			AVERAGE DAILY						AVERAGE DAILY			Laxation rate†	Elimination time‡
			Dry wt.‡	Total water†	Fat	In-take	Urine	Feces	Wet wt.	Dry wt.‡	Fat		
mo.-day	cm.	kg.	gm.	gm.	gm.	Cal.	Cal.	Cal.	gm.	gm.	gm.		hours
10-5	104	15.99	313	1278	57.5	1615	58	33	108.0	14.0	1.5	1.6	32
10-10	104	16.05	314	1227	57.5	1618	53	81	103.2	18.0	1.8	2.0	10
10-15	104	16.15	318	1139	57.5	1636	48	87	124.6	20.0	2.0	2.3	10
10-20	104	16.23	312	1126	57.5	1612	56	63	82.2	12.0	1.2	1.8	7
10-25	104	16.42	311	1135	57.5	1606	56	62	82.2	14.0	1.4	1.8	11
10-30	105	16.56	314	1155	57.5	1618	62	77	85.2	21.0	2.4	1.6	25
11-4	105	16.73	311	1214	58.9	1622	56	81	101.0	15.0	1.6	2.2	11
11-9	105	16.77	309	1161	58.9	1613	51	50	82.8	10.0	1.2	1.6	11
11-14	105	16.82	310	1247	58.9	1617	52	50	70.6	11.0	1.4	1.8	10
11-19	105	16.87	312	1217	—	1626	52	68	108.2	11.0	—	2.4	26
11-24	106	16.99	313	1249	58.9	1628	58	72	105.2	16.0	2.1	2.0	11
11-29	106	17.08	309	1264	58.9	1614	56	54	74.4	12.0	1.4	2.0	30
12-4	106	17.21	309	1274	60.8	1617	51	53	82.0	16.0	1.8	1.8	11
12-9	106	17.31	310	1258	60.8	1620	55	58	95.8	14.0	1.6	2.0	25
12-14	106	17.42	312	1312	60.8	1630	54	60	104.4	12.0	1.3	2.2	26
12-19	106	17.43	310	1320	60.8	1620	61	—	73.0	9.0	1.1	1.6	10
12-24	106	17.49	320	1330	60.8	1662	56	60	81.2	12.0	1.6	1.2	34
1-13	107	17.27	329	1080	64.1	1654	51	72	84.8	14.0	1.5	1.4	26
1-18	107	17.34	330	1007	64.1	1658	57	60	62.4	18.0	2.0	1.0	35
1-23	107	17.59	327	1159	64.1	1646	96	63	81.8	12.0	1.5	1.8	6
1-28	107	17.60	329	1070	64.1	1654	56	68	86.6	17.0	1.8	1.8	11
2-2	107	17.73	334	1158	64.1	1677	56	61	75.6	11.0	1.4	1.4	30
2-7	107	17.87	331	1122	64.1	1666	56	69	83.0	17.0	2.0	1.8	11
2-12	107	18.01	335	1167	64.1	1684	55	70	83.2	14.0	1.7	1.8	30
2-17	108	18.19	328	1179	64.1	1655	55	63	95.0	11.0	1.4	2.2	12
2-22	108	18.30	331	1199	64.1	1666	52	84	103.6	21.0	2.4	2.0	12
2-27	108	18.40	328	1220	64.1	1658	56	73	87.2	15.0	2.0	2.0	11
3-3	108	18.39	316	1364	62.6	1586	57	85	82.6	19.0	2.2	2.0	6
3-8	108	18.48	317	1324	62.6	1593	47	68	81.0	20.0	2.3	1.6	30
3-13	108	18.54	320	1374	62.6	1605	57	67	100.6	15.0	1.6	1.6	11
3-18	108	18.60	302	1232	66.4	1592	—	42	70.4	15.0	1.9	1.6	11
3-23	108	18.64	293	1184	66.4	1590	56	67	76.8	16.0	2.1	1.6	29
3-28	109	18.75	293	1260	66.4	1591	58	—	79.6	15.0	2.1	1.6	25
4-2	109	18.83	297	1109	66.4	1607	58	70	88.8	17.0	2.2	1.6	30
4-7	109	18.80	292	1240	66.4	1583	56	54	77.6	10.0	1.1	1.2	30
4-12	109	18.78	296	1219	66.4	1600	51	92	90.3	23.3	2.5	1.7	12
4-17	109	18.73	293	1240	66.4	1588	57	73	75.6	18.0	2.0	2.8	12
4-22	109	18.82	293	1242	66.4	1588	54	86	70.6	18.0	1.8	1.8	30
4-27	109	18.86	291	1270	66.4	1583	56	63	72.0	10.0	1.0	2.2	11
5-2	109	18.97	298	1267	66.4	1611	58	63	65.0	15.0	1.6	1.6	23
5-7	109	19.02	296	1575	66.4	1603	54	65	67.0	13.0	1.5	2.2	6

The age given is the initial age at start of study. Dates given are first days of five-day balance periods. Italic figures were omitted from calculations of the averages given in Volume I.

\* See Table 219 for actual values and method of smoothing.

† Based on alcohol-dried food and oven-dried feces.

‡ Drinking water plus water in foods.

§ Average number of defecations per day.

¶ Elapsed time between ingestion and defecation of marker used to separate feces of five-day periods.

# See case history, page 725.

TABLE 229

Barbara  
63 monthsNITROGEN AND NEGATIVE MINERALS IN INTAKE, URINE, FECES  
*Values are averages per day*

Date	NITROGEN			PHOSPHORUS			CHLORINE			SULFUR		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
10-5	9.45	8.01	1.10	996	540	249	3031	2775	16	612	517	59
10-10	9.45	8.03	1.09	996	650	383	3031	2739	31	612	524	96
10-15	9.45	7.53	1.09	996	640	367	3031	2712	42	612	524	100
10-20	9.45	8.11	0.99	996	636	303	3031	2762	20	612	528	67
10-25	9.45	7.88	1.03	996	585	277	3031	2808	16	612	532	69
10-30	9.45	8.25	0.92	996	492	331	3031	2724	24	612	546	81
11-4	9.26	7.80	0.93	951	605	332	2924	2604	119	596	513	92
11-9	9.26	7.88	1.02	951	590	234	2924	2688	20	596	505	53
11-14	9.26	7.87	0.73	951	584	229	2924	2674	24	596	515	51
11-19	9.26	7.98	0.96	951	595	276	2924	2646	30	596	514	72
11-24	9.26	7.81	1.03	951	557	318	2924	2440	30	596	496	74
11-29	9.26	8.00	0.88	951	622	228	2924	2628	39	596	506	56
12-4	9.26	8.09	0.89	951	576	254	2924	2664	53	596	504	65
12-9	9.26	7.81	0.94	951	633	238	2924	2554	57	596	489	58
12-14	9.26	7.88	0.94	951	630	228	2924	2592	55	596	500	60
12-19	9.26	8.08	0.94	951	591	275	2924	2419	36	596	508	64
12-24	9.26	8.01	0.89	951	579	262	2924	2746	52	596	512	66
***												
1-13	9.32	6.73	0.88	1024	463	334	2916	2714	63	629	449	79
1-18	9.32	7.66	0.84	1024	592	274	2916	2816	34	629	508	64
1-23	9.32	7.61	0.97	1024	569	224	2916	2574	35	629	500	59
1-28	9.32	7.72	0.93	1024	638	255	2916	2892	32	629	528	68
2-2	9.32	7.86	0.90	1024	678	242	2916	2673	24	629	554	62
2-7	9.32	7.75	0.92	1024	691	260	2916	2604	35	629	524	72
2-12	9.32	7.90	0.97	1024	712	292	2916	2694	52	629	534	70
2-17	9.32	7.39	0.95	1024	604	212	2916	2571	55	629	518	68
2-22	9.32	7.77	1.03	1024	688	287	2916	2617	65	629	518	89
2-27	9.32	7.93	0.96	1024	736	286	2916	2554	45	629	537	88
3-3	9.73	8.11	0.95	1026	692	351	3517	3306	52	646	559	92
3-8	9.73	8.23	1.02	1026	662	297	3517	3331	81	646	556	83
3-13	9.73	8.41	1.04	1026	685	259	3517	3367	65	646	552	76
3-18	9.44	8.17	0.82	1008	710	249	3037	2808	53	618	547	61
3-23	9.44	8.07	0.93	1008	652	280	3037	2916	58	618	532	68
3-28	9.44	8.05	0.84	1008	655	261	3037	2908	79	618	543	68
4-2	9.44	8.15	0.88	1008	672	308	3037	2964	60	618	530	70
4-7	9.44	7.62	0.91	1008	574	249	3037	2789	57	618	502	54
4-12	9.44	8.42	1.00	1008	652	429	3037	2808	70	618	553	104
4-17	9.44	8.28	1.00	1008	670	357	3037	2826	45	618	550	82
4-22	9.44	7.32	0.91	1008	568	398	3037	2576	50	618	496	55
4-27	9.44	7.78	0.97	1008	575	293	3037	2610	38	618	490	62
5-2	9.44	7.84	0.82	1008	555	306	3037	2935	40	618	398	69
5-7	9.44	7.93	0.88	1008	672	291	3037	2844	28	618	503	67

\* See footnotes to Table 228.

TABLE 230

Barbara  
63 months

## POSITIVE MINERALS IN INTAKE, URINE, FECES

*Values are averages per day*

Date	CALCIUM			MAGNESIUM			SODIUM			POTASSIUM		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
10-5	722	114	638	248	78	152	1876	1855	29	2252	1723	316
10-10	722	103	538	248	73	157	1876	1662	91	2252	1726	384
10-15	722	85	521	248	64	148	1876	1766	70	2252	1755	342
10-20	722	91	546	248	79	140	1876	1729	34	2252	1792	252
10-25	722	112	513	248	77	124	1876	1848	00	2252	1760	230
10-30	722	116	505	248	79	133	1876	1730	00	2252	1845	275
11-4	724	91	558	262	86	164	1769	1535	43	2628	2092	335
11-9	724	91	662	262	89	186	1769	1598	38	2628	2089	330
11-14	724	92	524	262	88	138	1769	1595	24	2628	2128	225
11-19	724	99	561	262	82	162	1769	1583	39	2628	2122	334
11-24	724	85	531	262	78	158	1769	1563	53	2628	2088	370
11-29	724	88	548	262	91	145	1769	1658	25	2628	1886	243
12-4	724	91	490	262	97	134	1769	1692	21	2628	2172	216
12-9	724	89	506	262	89	152	1769	1579	39	2628	2038	273
12-14	724	84	504	262	92	146	1769	1617	68	2628	2149	273
12-19	724	85	500	262	95	134	1769	1603	00	2628	2206	227
12-24	724	91	500	262	104	135	1769	1712	21	2628	2241	231
1-13	771	69	457	267	101	141	1861	1844	28	2640	2015	267
1-18	771	79	508	267	108	132	1861	1781	00	2640	2389	188
1-23	771	81	540	267	93	152	1861	1705	00	2640	2052	247
1-28	771	95	526	267	90	156	1861	1840	34	2640	2254	262
2-2	771	67	532	267	79	156	1861	1740	15	2640	2297	239
2-7	771	67	498	267	90	143	1861	1777	22	2640	2399	222
2-12	771	75	535	267	91	155	1861	1799	20	2640	2101	302
2-17	771	79	509	267	83	147	1861	1693	32	2640	1941	268
2-22	771	66	539	267	88	161	1861	1778	46	2640	2027	291
2-27	771	61	560	267	89	166	1861	1735	25	2640	2030	234
3-3	783	89	563	316	89	178	2258	2209	27	2597	1968	297
3-8	783	96	558	316	86	190	2258	2203	102	2597	2034	286
3-13	783	96	555	316	96	177	2258	2088	96	2597	2181	261
3-18	792	89	548	261	86	138	1887	1839	32	2501	1915	263
3-23	733	112	520	261	92	134	1887	1788	15	2501	2007	270
3-28	733	94	455	261	90	132	1887	1814	36	2501	1902	248
4-2	733	84	473	261	86	144	1887	1868	35	2501	1967	254
4-7	733	82	512	261	80	152	1887	1753	20	2501	1777	271
4-12	733	103	518	261	85	141	1887	1735	54	2501	1864	289
4-17	733	94	500	261	80	144	1887	1772	24	2501	2010	295
4-22	733	81	426	261	74	139	1887	1588	42	2501	1787	239
4-27	733	104	506	261	83	143	1887	1641	36	2501	1831	255
5-2	733	108	445	261	91	126	1887	1858	20	2501	2022	205
5-7	733	100	480	261	94	132	1887	1752	26	2501	1956	211

\* See footnotes to Table 228.

TABLE 231

Barbara  
63 months

## COMPLEX CARBOHYDRATES IN INTAKE AND FECES

*Values in grams per day*

Date	LIGNIN		CELLULOSE		HEMICELLULOSE		
	Intake	Feces	Intake	Feces	INTAKE		Feces
					Total	Stable	
10-5 ***	1.28	1.16	2.08	0.58	2.17	1.72	1.17
10-15	1.28	1.35	2.08	0.86	2.17	1.72	1.44
10-20 ***	1.28	1.20	2.08	0.62	2.17	1.72	1.01
10-30	1.28	2.05	2.08	0.96	2.17	1.72	1.81
11-4	1.62	1.92	2.03	0.44	1.82	1.43	0.91
11-9	1.62	1.66	2.03	0.39	1.82	1.43	0.65
11-14	1.62	1.56	2.03	0.31	1.82	1.43	0.76
11-19	1.61	2.48	2.02	0.34	1.76	1.36	0.43
11-24	1.63	1.57	2.05	0.63	1.88	1.50	0.86
11-29	1.61	1.49	2.02	0.39	1.76	1.36	0.67
12-4	1.62	1.61	2.03	0.73	1.82	1.43	0.82
12-9 ***	1.62	1.92	2.03	0.50	1.82	1.43	0.73
12-19	1.62	1.31	2.03	0.29	1.82	1.43	0.53
12-24 ***	1.62	1.56	2.03	0.35	1.82	1.43	0.76
1-13	1.62	1.87	2.03	0.50	1.82	1.43	0.66
1-18	1.61	2.40	2.02	0.26	1.76	1.36	1.04
1-23	1.62	1.48	2.03	0.34	1.82	1.43	0.74
1-28	1.62	2.05	2.03	0.69	1.82	1.43	0.92
2-2	1.62	1.36	2.03	0.18	1.82	1.43	0.72
2-7 ***	1.62	1.83	2.03	0.52	1.82	1.43	0.80
2-17	1.62	1.35	2.03	0.33	1.82	1.43	0.56
2-22	1.62	2.91	2.03	0.27	1.82	1.43	0.92
2-27	1.62	1.78	2.03	0.56	1.82	1.43	0.70
3-3	1.41	1.72	2.37	1.03	2.31	1.82	0.83
3-8	1.41	2.09	2.37	0.88	2.31	1.82	0.97
3-13	1.41	1.91	2.37	0.16	2.31	1.82	0.89
3-18	1.28	1.42	2.08	0.41	2.17	1.72	1.08
3-23	1.28	1.62	2.08	0.60	2.17	1.72	0.72
3-28	1.31	1.41	2.14	0.49	2.35	1.93	1.05
4-2	1.28	1.47	2.08	0.54	2.17	1.72	1.13
4-7	1.28	1.04	2.08	0.48	2.17	1.72	0.64
4-12	1.28	2.16	2.08	0.76	2.17	1.72	1.60
4-17	1.28	1.80	2.08	0.61	2.17	1.72	1.04
4-22	1.28	1.54	2.08	1.13	2.17	1.72	0.92
4-27	1.28	0.91	2.08	0.47	2.17	1.72	0.75
5-2	1.28	1.43	2.08	0.43	2.17	1.72	1.08
5-7	1.28	1.22	2.08	0.49	2.17	1.72	0.97

The age given is the initial age at start of study. Dates given are first days of five-day balance periods. Italic figures were omitted from calculations of the averages given in Volume I.

\* See case history, page 725.



TABLE 232

Barbara  
69 months

## NITROGEN PARTITION OF URINE

*Values in grams of nitrogen per day*

Date	Total nitrogen	Urea	Ammonia	Creatinine + Creatine	Creatinine	Uric acid
3-28	7.73	5.683	0.257	0.255	0.136	0.116
3-29	8.00	7.098	0.242	0.297	0.183	0.119
3-30	7.95	6.942	0.298	0.357	0.153	0.114
3-31	7.60	6.657	0.243	0.334	0.134	0.117
4-1	8.99	7.857	0.283	0.352	0.158	0.119
4-2	7.50	6.064	0.256	0.297	0.139	0.125
4-3	8.28	6.987	0.273	0.297	0.125	0.114
4-4	8.64	7.426	0.254	0.315	0.147	0.122
4-5	8.60	7.238	0.202	0.300	0.166	0.138
4-6	7.73	6.760	0.200	0.300	0.151	0.122
4-7	9.09	7.967	0.241	0.318	0.148	0.122
4-9	5.06	4.457	0.183	0.230	0.094	0.077
4-10	8.58	7.543	0.257	0.349	0.154	0.120
4-11	7.77	6.591	0.249	0.293	0.126	0.113
4-12	9.47	8.391	0.229	0.388	0.188	0.159
4-13	7.46	6.455	0.253	0.333	0.161	0.116
4-14	9.22	7.947	0.253	0.336	0.164	0.143
4-15	7.87	6.934	0.266	0.272	0.154	0.111
4-16	8.07	7.147	0.243	0.293	0.154	0.123
4-17	8.46	7.681	0.259	0.283	0.158	0.132
4-18	7.96	7.109	0.267	0.277	0.184	0.117
4-19	7.78	6.913	0.221	0.293	0.170	0.130
4-20	8.87	7.967	0.291	0.275	0.164	0.131
4-21	8.33	7.293	0.297	0.238	0.136	0.129
4-22	6.51	5.761	0.233	0.215	0.136	0.103
4-23	6.51	5.804	0.162	0.247	0.177	0.124
4-24	8.62	7.740	0.192	0.295	0.188	0.131
4-25	7.66	6.721	0.287	0.249	0.143	0.122
4-26	7.32	6.517	0.247	0.257	0.164	0.113
4-27	8.02	7.141	0.215	0.269	0.130	0.115
4-28	7.59	6.747	0.247	0.262	0.157	0.109
4-29	7.28	6.386	0.220	0.254	0.139	0.108
4-30	7.80	6.841	0.285	0.284	0.154	0.105
5-1	8.23	7.342	0.260	0.281	0.177	0.111
5-2	8.02	11.526	0.229	0.290	0.172	0.118
5-3	7.91	6.877	0.217	0.322	0.157	0.121
5-4	8.08	6.902	0.208	0.310	0.152	0.119
5-5	7.64	6.756	0.240	0.265	0.157	0.108
5-6	7.55	6.756	0.234	0.304	0.157	0.112
5-7	8.33	7.322	0.290	0.282	0.152	0.117
5-8	7.93	7.097	0.231	0.323	0.193	0.134
5-9	7.64	6.864	0.212	0.254	0.175	0.110
5-10	7.57	6.662	0.228	0.356	0.184	0.129
5-11	8.18	7.480	0.288	0.288	0.158	0.110

The age given is the initial age at start of study.

TABLE 233

Barbara  
63 months

## IRON IN INTAKE, URINE AND FECES

*Values are averages per day*

Date	Intake	Urine	Feces	Date	Intake	Urine	Feces	Date	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mo.-day	mg.	mg.	mg.	mo.-day	mg.	mg.	mg.
10-5	7.39	0.52	5.28	12-14	7.07	0.15	4.35	3-3	8.38	0.00	8.12
10-10	7.39	0.19	5.49	12-19	7.07	0.04	3.72	3-8	8.38	1.05	8.22
10-15	7.39	0.52	5.60	12-24	7.07	0.08	5.20	3-13	8.38	0.24	5.64
10-20	7.39	0.19	5.67	§§§				3-18	7.40	0.50	6.22
10-25	7.39	0.61	5.70	1-13	7.15	0.17	5.78	3-23	7.40	0.09	6.12
10-30	7.39	0.24	9.92	1-18	7.15	0.01	8.01	3-28	7.40	0.03	8.76
11-4	7.07	0.16	5.34	1-23	7.15	0.00	4.98	4-2	7.40	0.04	6.22
11-9	7.07	0.08	3.58	1-28	7.15	0.11	6.20	4-7	7.40	0.06	4.75
11-14	7.07	0.01	4.12	2-2	7.15	0.11	4.15	4-12	7.40	0.05	9.96
11-19	7.07	0.12	4.34	2-7	7.17	0.04	6.16	4-17	7.40	0.02	8.32
11-24	7.07	0.01	4.90	2-12	7.17	0.14	4.99	4-22	7.40	0.02	8.10
11-29	7.07	0.10	4.13	2-17	7.17	0.01	3.63	4-27	7.40	0.01	4.15
12-4	7.07	0.13	5.96	2-22	7.17	0.01	6.88	5-2	7.40	0.03	6.77
12-9	7.07	0.13	4.88	2-27	7.17	0.04	5.49	5-7	7.40	0.04	6.42

The age given is the initial age at start of study. Dates given are first days of five-day balance periods.

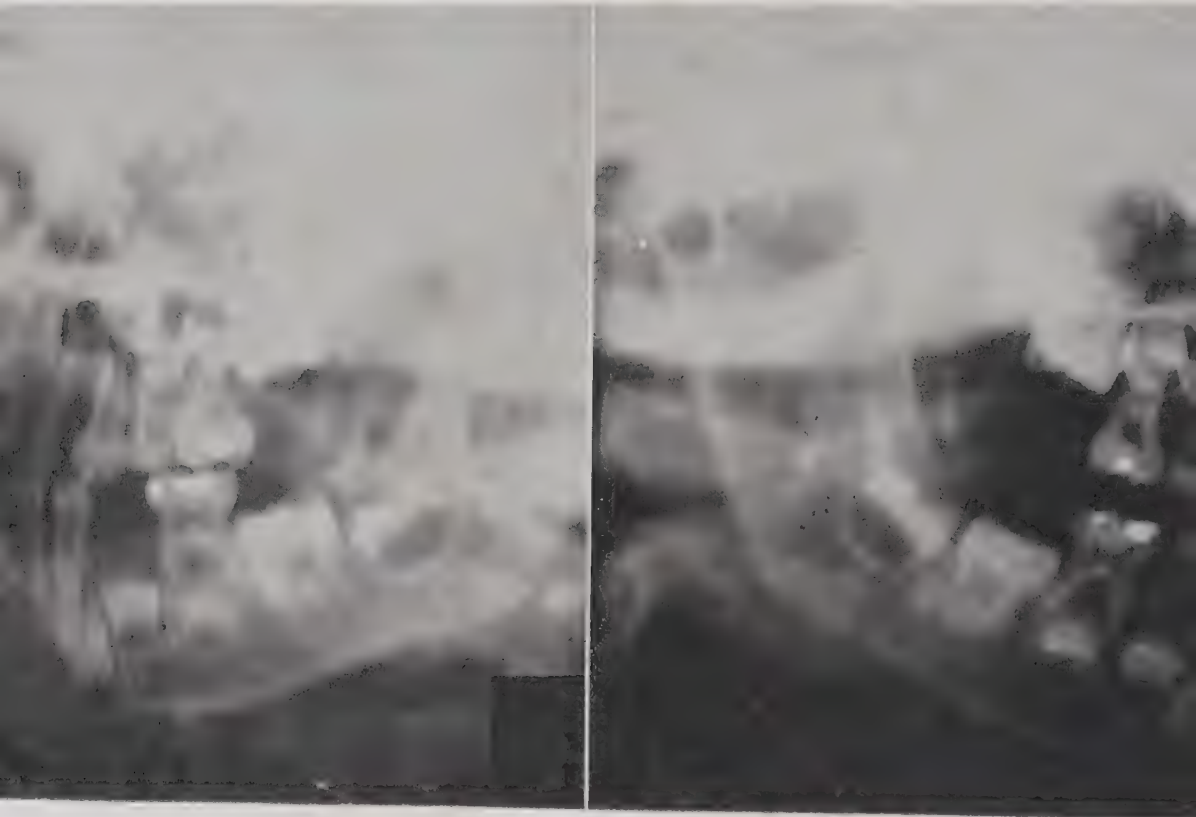
§§§ See case history, page 725 for explanation for missing periods.

TABLE 234

Barbara  
69 months

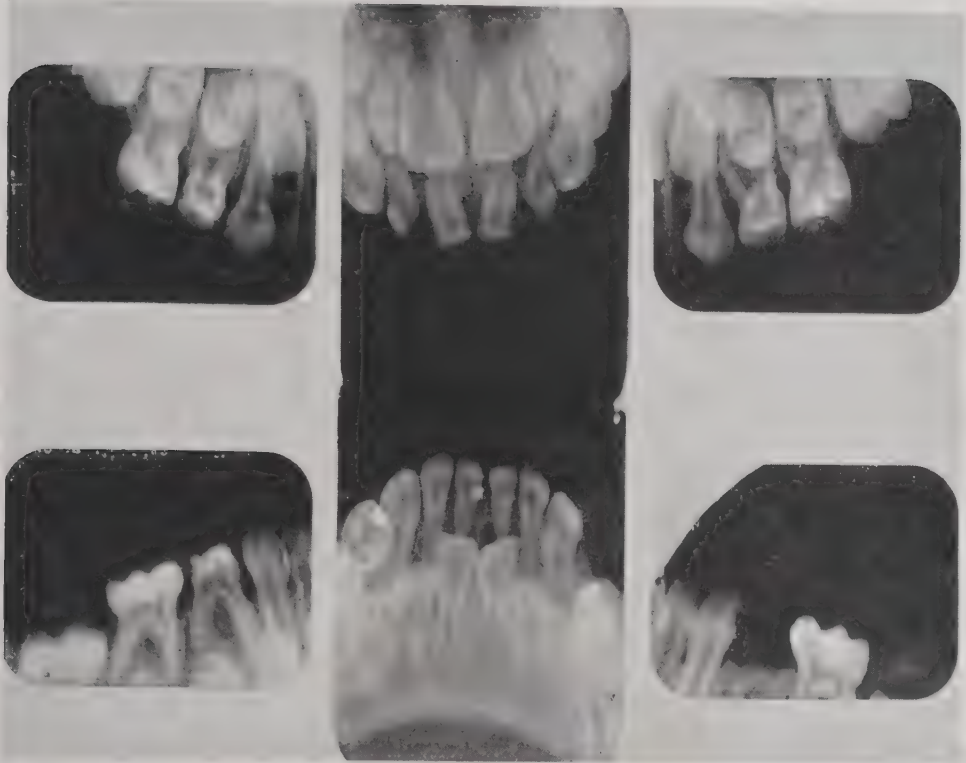
## TEMPERATURE AND PULSE

Date	Temperature	Pulse	Date	Temperature	Pulse	Date	Temperature	Pulse
4-7	98.4	80	4-19	98.4	92	5-2	99.0	92
4-8	98.0	80	4-20	99.2	92	5-3	98.6	80
4-9	98.2	92	4-21	98.2	83	5-4	98.4	84
4-10	98.2	84	4-22	98.4	86	5-5	98.2	88
4-11	98.6	92	4-23	98.6	100	5-6	98.2	84
4-12	98.2	85	4-24	98.6	96	5-7	98.6	88
			4-25	99.2	100			
4-13	98.6	92	4-26	98.6	92	5-8	98.2	93
4-14	98.4	88	4-27	98.2	86	5-9	98.2	92
4-15	98.2	92	4-28	98.6	96	5-10	98.4	92
4-16	98.2	94	4-29	98.4	92	5-11	98.4	92
4-17	98.2	88	4-30	98.2	86	5-12	98.2	84
4-18	99.2	92	5-1	98.2	86	5-13	98.6	84



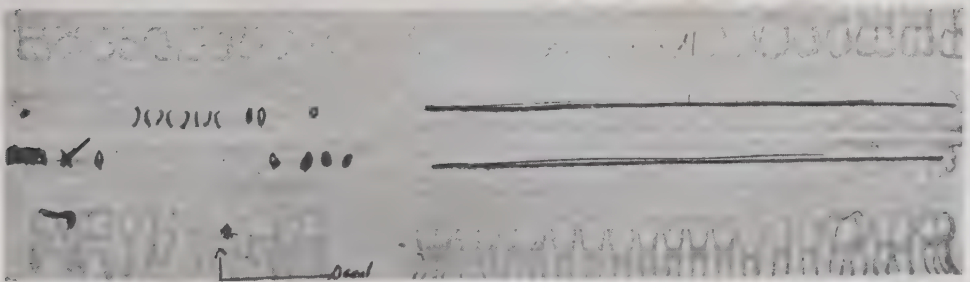
## BARBARA

FIGURE 308. Actual size reproduction of roentgenogram of jaws.  
Chronological age 65 months.



BARBARA

FIGURE 309. Roentgenograms of teeth, age 65 months.



BARBARA

FIGURE 310. Dental examination, age 65 months.





FIGURE 311. BARBARA, age 67 months.



BARBARA

FIGURE 312. Actual size reproduction of roentgenogram of left hand.  
Chronological age 68 months.



BARBARA

FIGURE 313. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 68 months.



## BARBARA

FIGURE 314. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 68 months.





## BARBARA

FIGURE 315. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 68 months.



BARBARA

FIGURE 316. Actual size reproduction of roentgenogram of left hip.  
Chronological age 68 months.



BARBARA

FIGURE 317. Actual size reproduction of roentgenogram of left knee.  
Chronological age 68 months.



BARBARA

FIGURE 318. Actual size reproduction of roentgenogram of left knee.  
Chronological age 68 months.





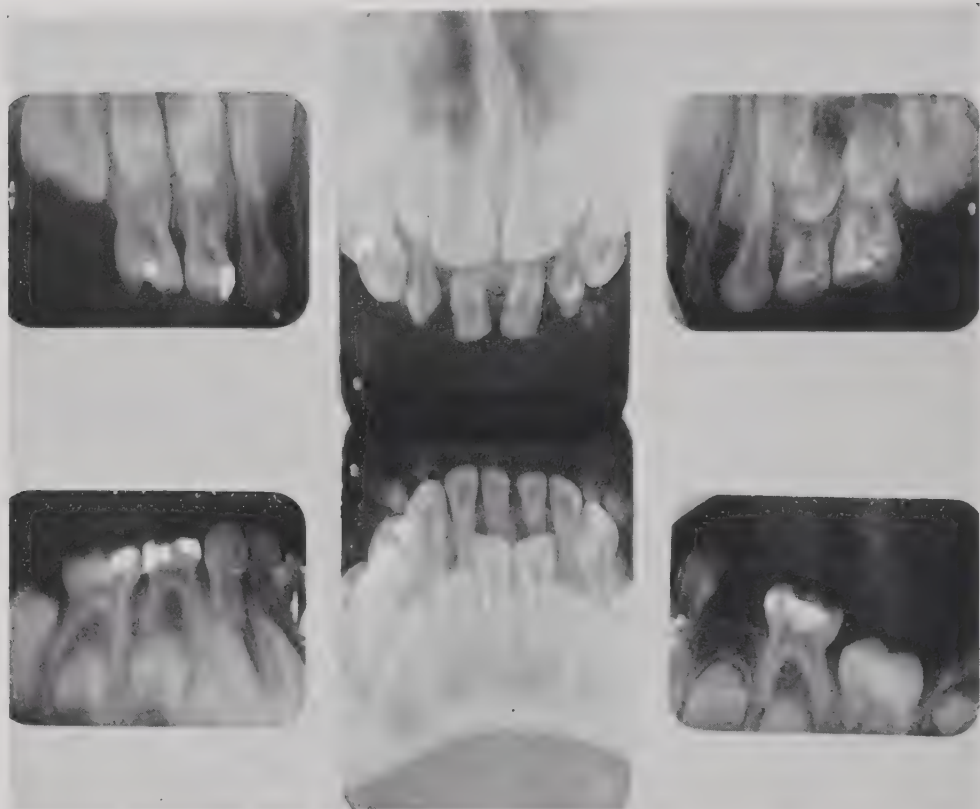
BARBARA

FIGURE 319. Actual size reproduction of roentgenogram of left foot.  
Chronological age 68 months.



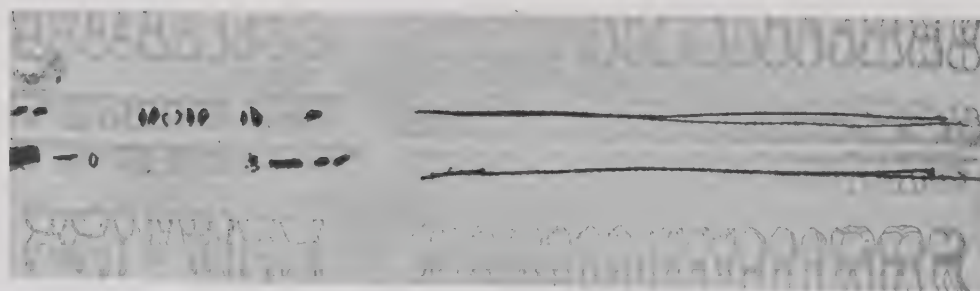
## BARBARA

FIGURE 320. Actual size reproduction of roentgenogram of left foot.  
Chronological age 68 months.



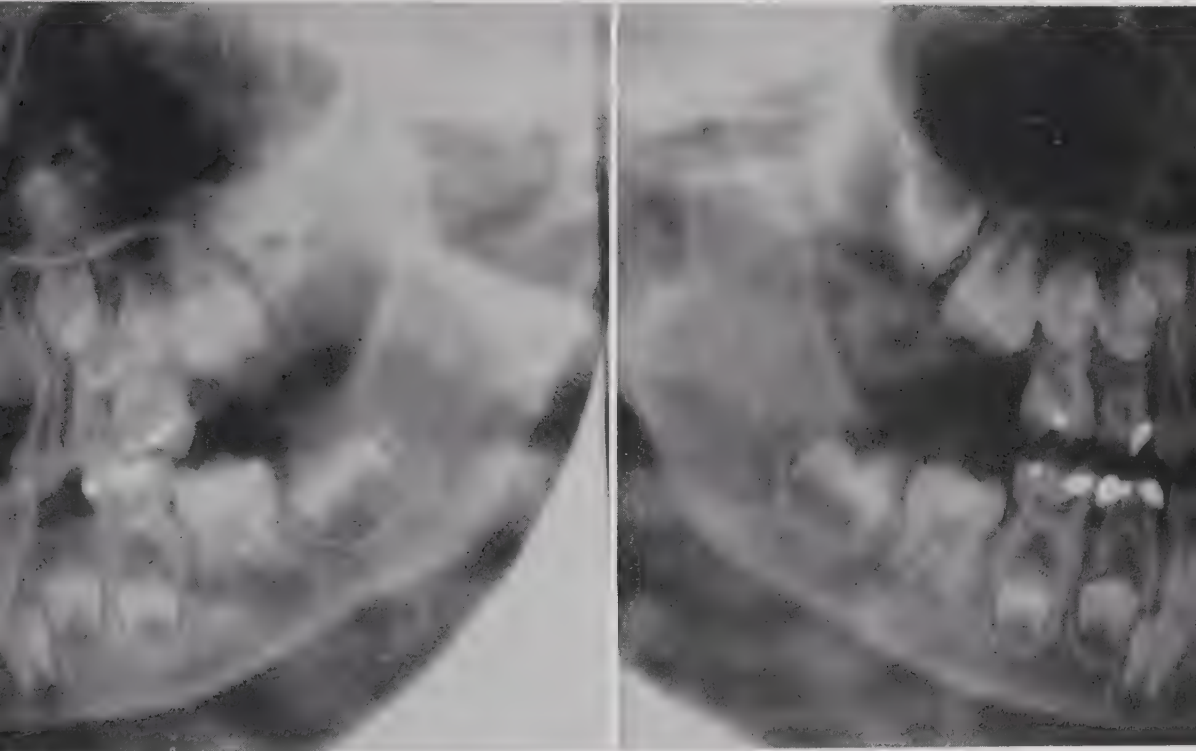
BARBARA

FIGURE 321. Roentgenograms of teeth, age 70 months.



BARBARA

FIGURE 322. Dental examination, age 70 months.



BARBARA

FIGURE 323. Actual size reproduction of roentgenogram of jaws.  
Chronological age 70 months.





BARBARA

FIGURE 324. Actual size reproduction of roentgenogram of left hand.  
Chronological age 70 months.



BARBARA

FIGURE 325. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 70 months.



## BARBARA

FIGURE 326. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 70 months.



BARBARA

FIGURE 327. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 70 months.





## BARBARA

FIGURE 328. Actual size reproduction of roentgenogram of left hip.  
Chronological age 70 months.



## BARBARA

FIGURE 329. Actual size reproduction of roentgenogram of left knee.  
Chronological age 70 months.



## BARBARA

FIGURE 330. Actual size reproduction of roentgenogram of left knee.  
Chronological age 70 months.



BARBARA

FIGURE 331. Actual size reproduction of roentgenogram of left foot.  
Chronological age 70 months.





BARBARA

FIGURE 332. Actual size reproduction of roentgenogram of left foot.  
Chronological age 70 months.

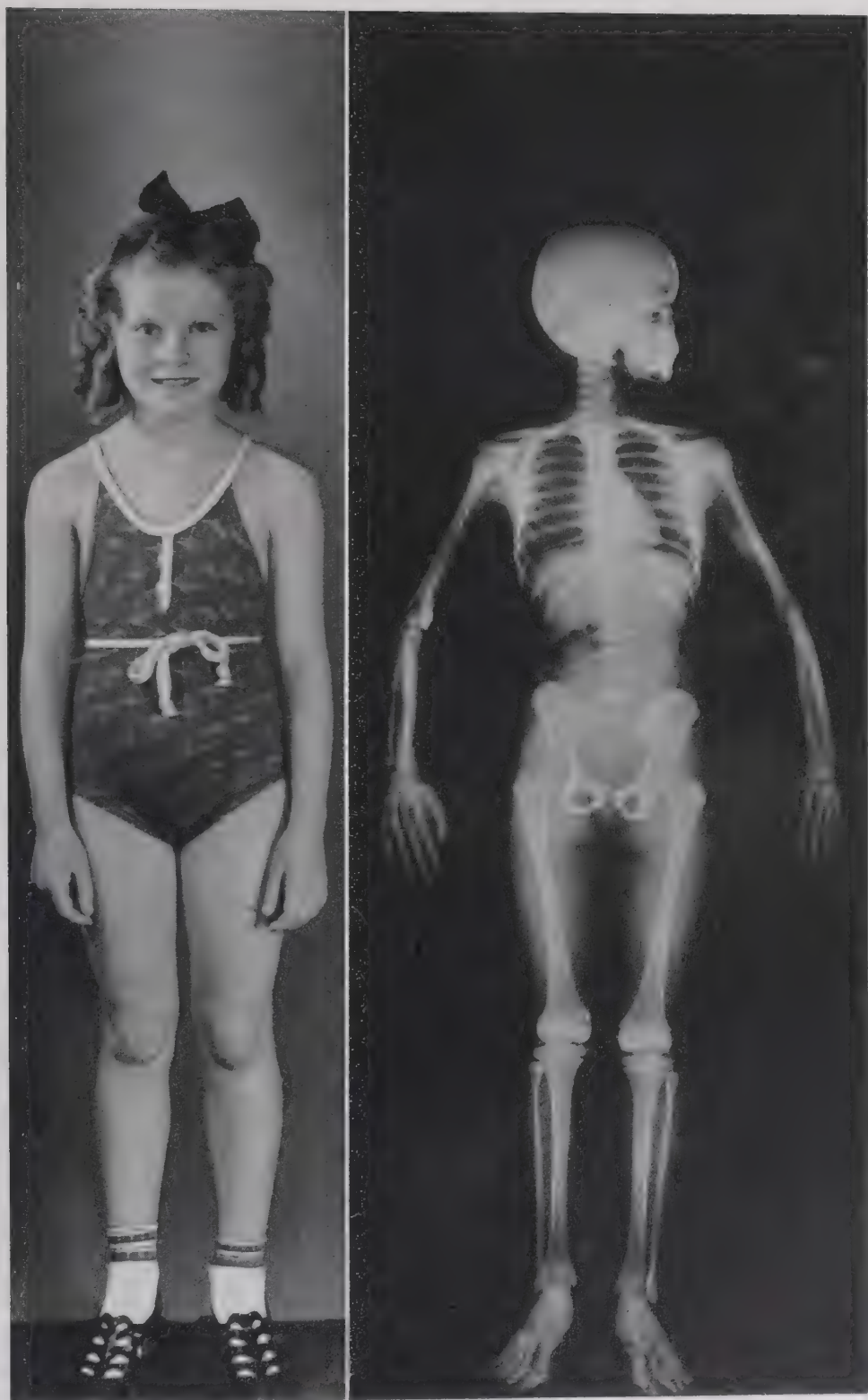


FIGURE 333. BARBARA, age 84 months.

## ROENTGENOGRAMS OF PROGRESS OF BAR

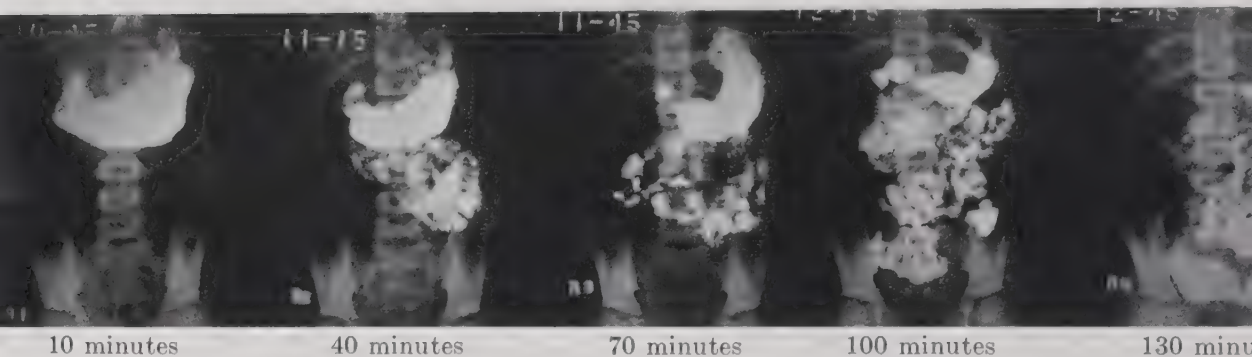


FIGURE 334. Progress of meal consisting of 2 ounces of barium sulfate and 4 ounces of water. The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

BARBARA  
Age, 79 months

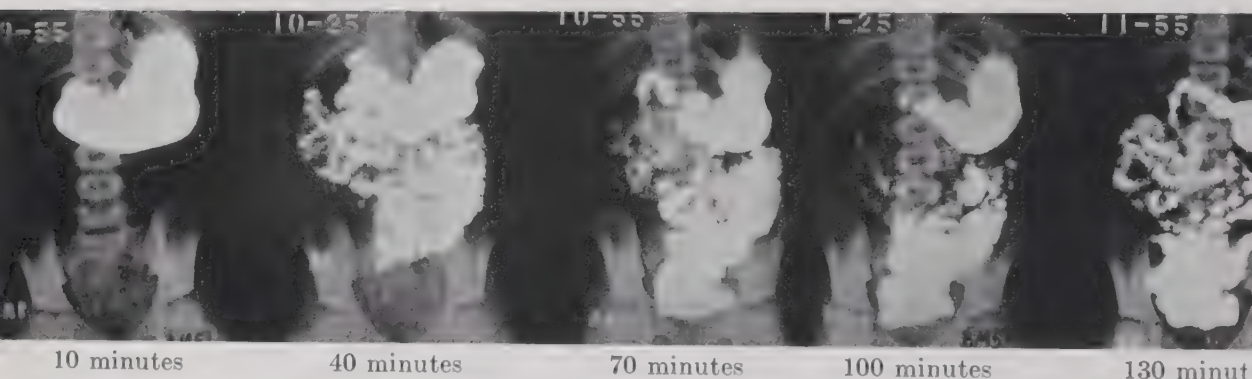


FIGURE 335. Progress of meal consisting of 2 ounces of barium sulfate and 4 ounces of standard pasteurized milk (3.5 per cent fat). The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

BARBARA  
Age, 79 months

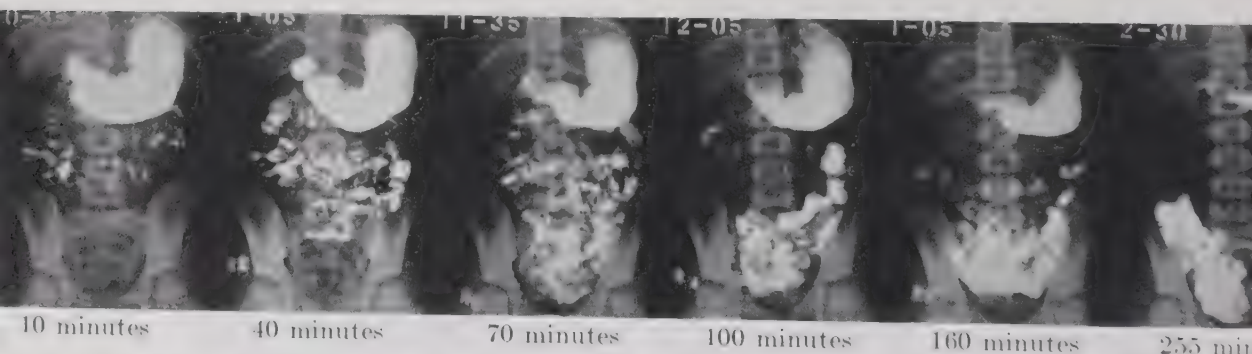
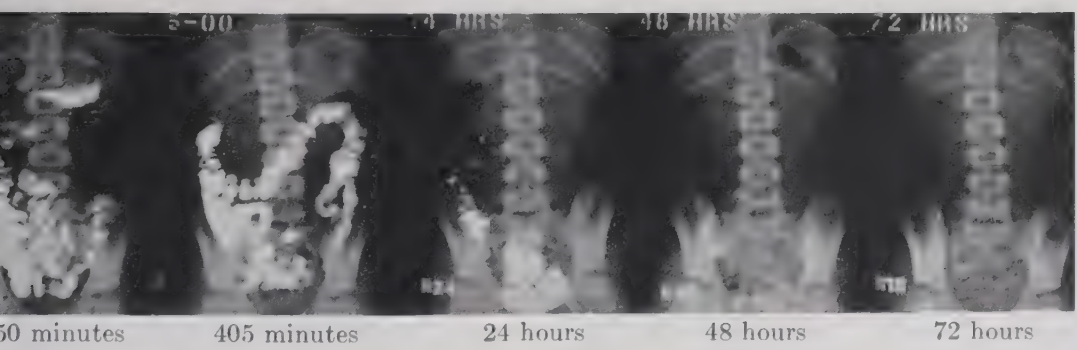
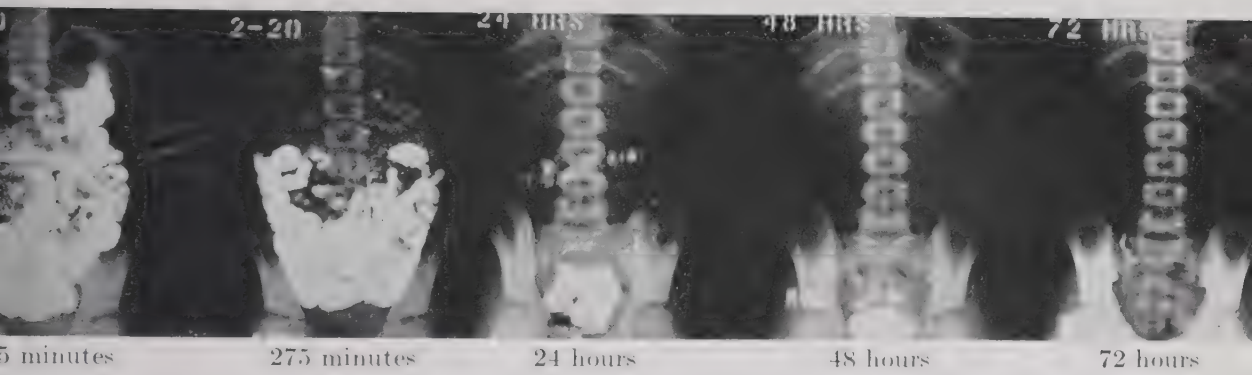
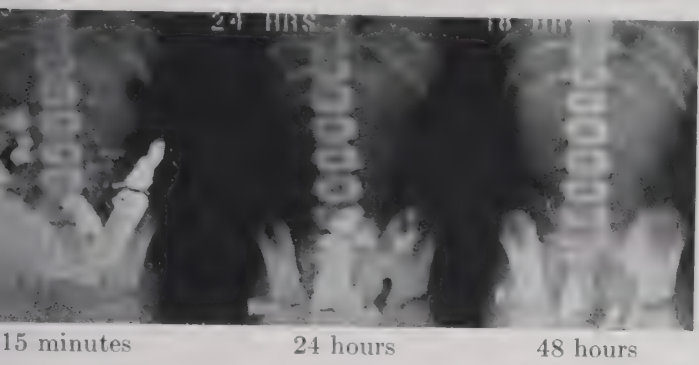


FIGURE 336. Progress of meal consisting of 40 grams of barium sulfate mixed with 100 grams of raw, ground lean meat, baked twenty to thirty minutes and ingested with 200 ml. of water. In the 290 gm. of barium, meat and water ingested (about 50 gm. of water were lost in cooking) the concentrations of fat and protein were approximately 3.5 and 7 per cent, respectively.

BARBARA  
Age, 79 months



REALS THROUGH GASTROINTESTINAL TRACT





## ROENTGENOGRAMS OF PROGRESS OF BA

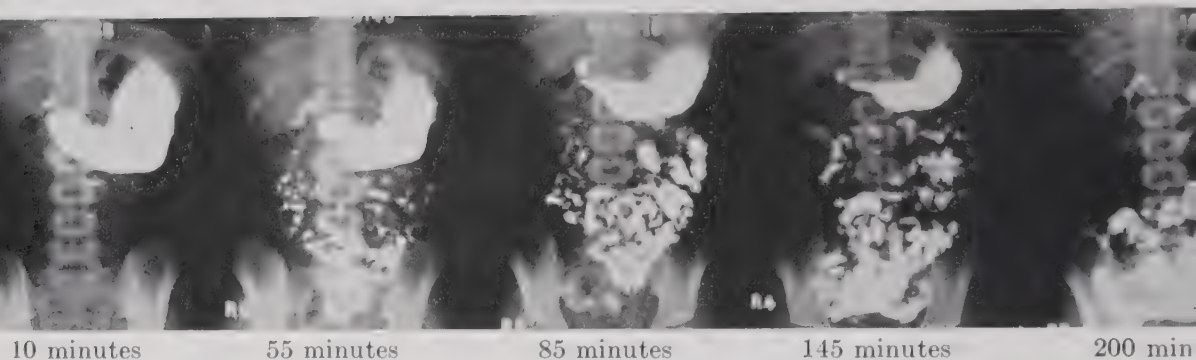


FIGURE 337. Progress of meal consisting of 2 ounces of barium sulfate and 4 ounces of evaporated milk, diluted 1:1 with water. The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

BARBARA  
Age, 99 months

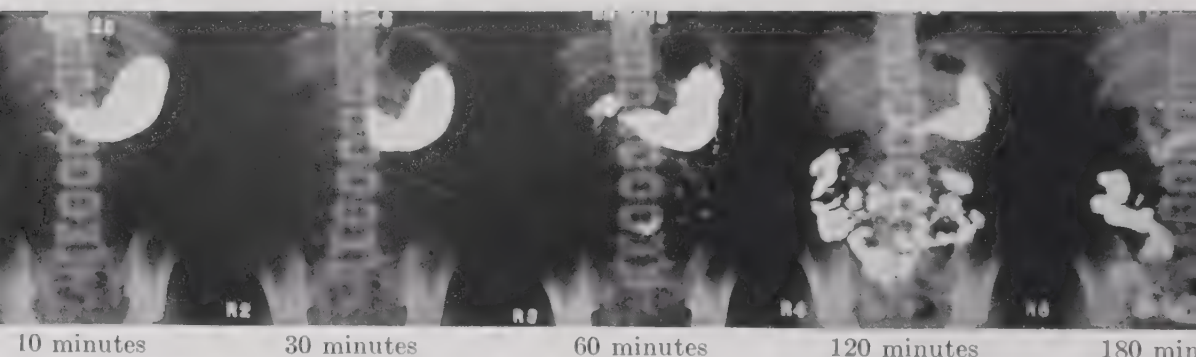


FIGURE 338. Progress of meal consisting of 2 ounces of barium sulfate and 4 ounces of base-exchanged milk. The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

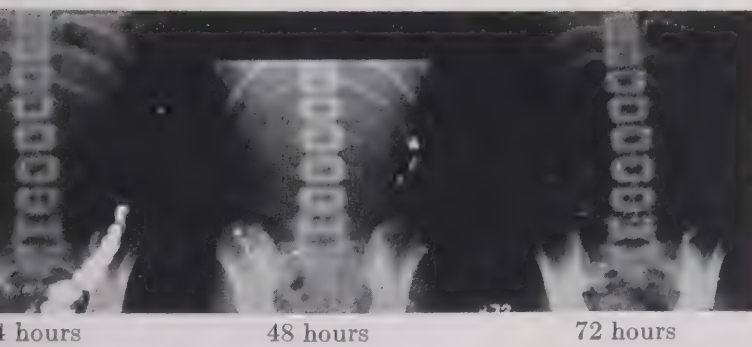
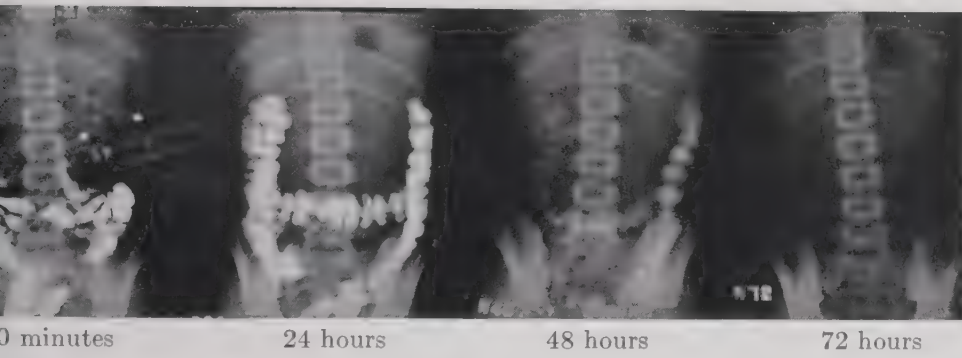
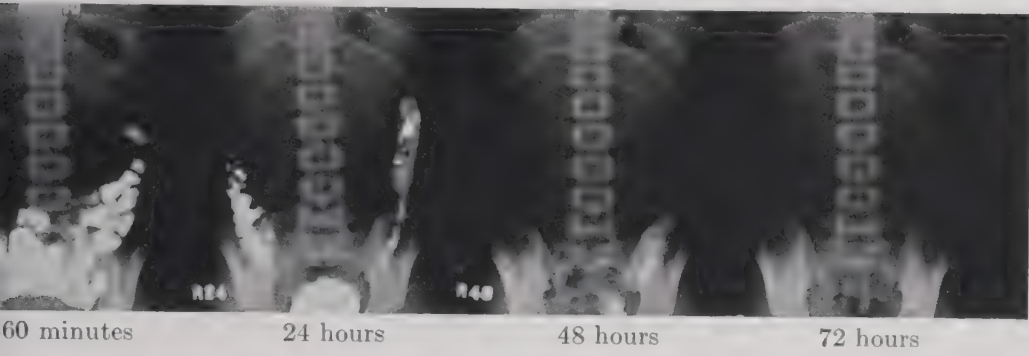
BARBARA  
Age, 99 months



FIGURE 339. Progress of meal consisting of 2 ounces of barium sulfate, 4 ounces of standard pasteurized milk and 0.2-0.3 gm. carmine. The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

BARBARA  
Age, 99 months

ALS THROUGH GASTROINTESTINAL TRACT



## ROENTGENOGRAMS OF PROGRESS OF BAR

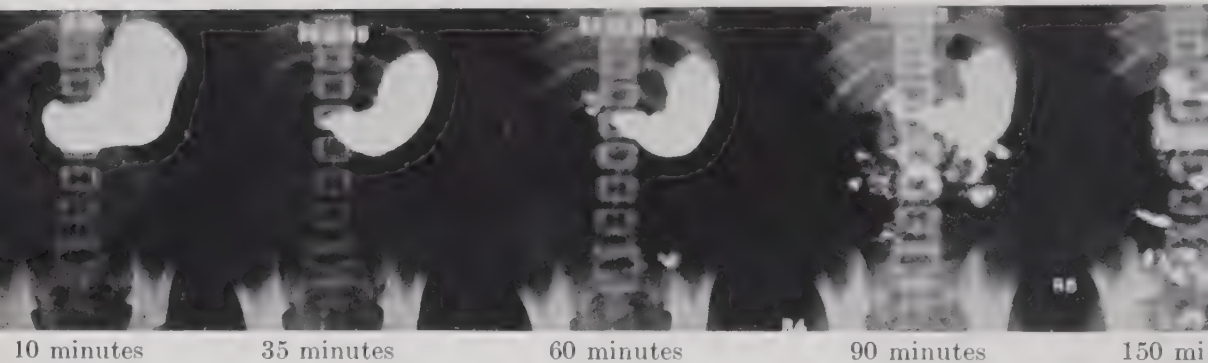
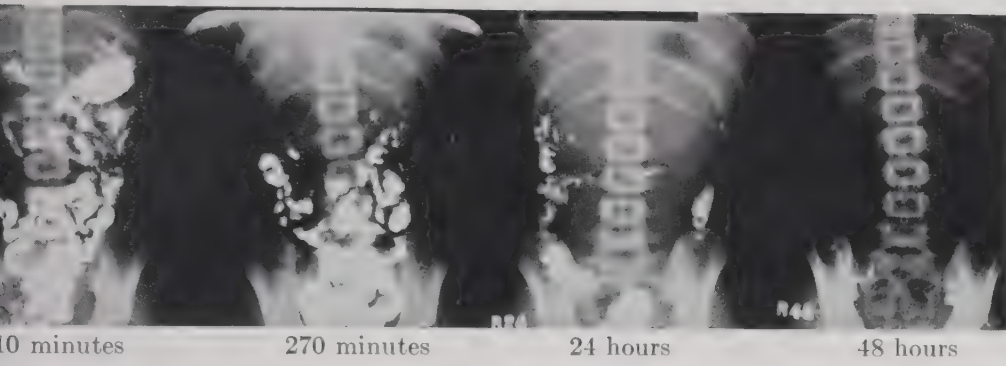


FIGURE 340. Progress of meal consisting of 2 ounces of barium sulfate and 4 ounces of standard and pasteurized milk (3.5 per cent fat). The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

BARBARA  
Age, 99 months

## ALS THROUGH GASTROINTESTINAL TRACT







BARBARA

FIGURE 341. Actual size reproduction of roentgenogram of left hand.  
Chronological age 84 months.



BARBARA

FIGURE 342. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 84 months.



## BARBARA

FIGURE 343. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 84 months.



BARBARA

FIGURE 344. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 84 months.





BARBARA

FIGURE 345. Actual size reproduction of roentgenogram of left hip.  
Chronological age 84 months.



BARBARA

FIGURE 346. Actual size reproduction of roentgenogram of left knee.  
Chronological age 84 months.



BARBARA

FIGURE 347. Actual size reproduction of roentgenogram of left knee.  
Chronological age 84 months.



BARBARA

FIGURE 348. Actual size reproduction of roentgenogram of left foot.  
Chronological age 84 months.





BARBARA

FIGURE 349. Actual size reproduction of roentgenogram of left foot.  
Chronological age 84 months.



BARBARA

FIGURE 350. Actual size reproduction of roentgenogram of left hand.  
Chronological age 110 months.



## BARBARA

FIGURE 351. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 110 months.



BARBARA

FIGURE 352. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 110 months.





BARBARA

FIGURE 353. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 110 months.



BARBARA

FIGURE 354. Actual size reproduction of roentgenogram of left hip.  
Chronological age 110 months.



## BARBARA

FIGURE 355. Actual size reproduction of roentgenogram of left knee.  
Chronological age 110 months.



BARBARA

FIGURE 356. Actual size reproduction of roentgenogram of left knee.  
Chronological age 110 months.





FIGURE 357. BARBARA. Actual size reproduction of roentgenogram of left foot.  
Chronological age 110 months.



BARBARA

FIGURE 358. Actual size reproduction of roentgenogram of left foot.  
Chronological age 110 months.

TABLE 235

Barbara  
111 months

## FOOD INTAKE

*Values in grams per day*

Food	DATE	Food	DATE	Food	DATE
	9-18 to 11-12		9-18 to 11-12		9-18 to 11-12
Apple	100	Cheese, American	20	Orange juice, canned	100
Banana	150	Corn flakes	30	Peanut butter	16
Beef, lean	100	Egg, whole	100	Peas, quick frozen	25
Bread, white	50	Gelatin	3	Potato	60
Bread, whole wheat	50	Graham cracker	36	Salt	2
Butter oil	30	Honey	15	Sugar (average)	16
Cabbage	25	Lettuce	25	Tomato juice	60
Carrot	50	Milk, fluid, irradiated	500	Water (average)	568

TABLE 236

Barbara  
111 months

## BODY LENGTH AND WEIGHT—INTAKE AND ELIMINATION

Date	Recumbent length*	Weight*	INTAKE			AVERAGE DAILY HEAT OF COMBUSTION			FECES				
			AVERAGE DAILY						AVERAGE DAILY			Laxation rate†	Elimination time§
			Dry wt.‡	Total water†	Fat	In- take	Urine	Feces	Wet wt.	Dry wt.‡	Fat		
mo.-day	cm.	kg.	gm.	gm.	gm.	Cal.	Cal.	Cal.	gm.	gm.	gm.		hours
9-18	131	26.51	402	1946	78.5	2053	80	113	147.4	23.1	3.4	2.6	25
9-23	131	26.75	404	1684	80.5	2073	85	122	132.6	24.8	3.6	2.0	26
9-28	131	27.21	437	1638	88.1	2244	88	99	97.4	20.6	3.0	1.8	12
10-3	131	27.46	412	1752	83.4	2107	89	92	79.8	18.9	2.7	1.4	36
10-8	131	27.86	424	1753	84.2	2157	90	98	—	20.1	2.7	1.4	26
10-13	131	28.06	404	1709	83.0	2088	86	106	84.6	22.3	2.9	1.2	36
10-18	131	28.32	465	1646	84.2	2333	87	102	86.0	20.3	2.7	1.2	11
10-23	131	29.08	460	1654	83.0	2312	86	96	90.2	19.2	2.4	1.2	36
10-28	132	29.14	424	1638	80.5	2137	89	98	79.8	19.9	2.8	1.0	37
11-2	132	29.38	403	1693	82.7	2089	87	112	102.6	23.3	3.0	1.2	30
11-7	132	29.64	426	1674	82.1	2168	91	98	75.0	20.6	2.6	1.2	35

The age given is the initial age at start of study. Dates given are first days of five-day balance periods.

\* See Table 219 for actual values and method of smoothing.

† Based on vacuum-dried food and cryochem-dried feces. Corresponding values for alcohol-dried food and oven-dried feces are given in Table 597, page 1421.

‡ Drinking water plus water in foods.

§ Average number of defecations per day.

§ Elapsed time between ingestion and defecation of marker used to separate feces of five-day periods.

TABLE 237

Barbara  
111 monthsNITROGEN AND NEGATIVE MINERALS IN INTAKE, URINE, FECES  
*Values are averages per day*

Date	NITROGEN			PHOSPHORUS			CHLORINE			SULFUR		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
9-18	12.69	10.03	1.35	1437	810	497	4403	4082	43	984	712	137
9-23	12.47	10.16	1.44	1455	853	340	4325	4178	39	933	679	147
9-28	13.05	10.16	1.22	1432	900	334	4376	4047	27	1011	686	121
10-3	13.54	10.86	1.16	1488	914	377	4312	4205	26	965	745	112
10-8	12.86	10.24	1.22	1429	886	414	4141	4134	46	1032	714	118
10-13	13.18	10.18	1.21	1492	894	333	4270	4150	37	868	690	125
10-18	13.05	10.56	1.20	1492	906	370	4471	4217	30	1006	730	116
10-23	13.45	10.59	1.15	1494	904	374	4414	4124	32	1058	730	109
10-28	13.14	10.51	1.20	1413	912	363	4275	4094	24	924	754	114
11-2	13.26	10.87	1.26	1450	918	404	4426	4285	45	944	745	134
11-7	13.00	10.94	1.10	1522	926	316	4315	4175	18	983	749	110

TABLE 238

Barbara  
111 monthsPOSITIVE MINERALS IN INTAKE, URINE, FECES  
*Values are averages per day*

Date	CALCIUM			MAGNESIUM			SODIUM			POTASSIUM		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
9-18	928	135	603	284	88	173	3032	2554	79	3256	2487	477
9-23	961	166	704	299	101	178	2966	2811	29	3170	2552	467
9-28	914	120	564	277	107	133	3053	2636	16	3176	2584	262
10-3	944	126	589	305	121	141	3043	2790	13	3252	2537	248
10-8	907	137	656	282	127	160	2950	2705	30	3252	2536	294
10-13	940	135	533	305	126	127	3052	2677	26	3268	2645	272
10-18	933	131	582	294	122	149	3002	2790	17	3266	2752	245
10-23	944	132	590	293	131	162	2974	2728	23	3293	2768	238
10-28	932	138	574	281	131	151	3008	2668	16	3230	2908	258
11-2	961	120	623	284	130	158	2980	2836	34	3277	2852	338
11-7	995	131	520	296	133	120	2909	2757	11	3332	2783	202



COMPLEX CARBOHYDRATES IN INTAKE AND FECES  
*Values in grams per day*

Date	LIGNIN		CELLULOSE		HEMICELLULOSE		
	Intake	Feces	Intake	Feces	INTAKE		Feces
					Total	Stable	
9-18	1.25	1.22	2.74	0.74	2.80	1.61	0.82
9-23	1.25	1.20	2.74	1.53	2.80	1.61	0.79
9-28	1.25	1.15	2.74	0.88	2.80	1.61	0.64
10-3	1.25	1.18	2.74	0.97	2.80	1.61	0.55
10-8	1.25	1.16	2.74	1.11	2.80	1.61	0.76
10-13	1.25	1.86	2.74	0.73	2.80	1.61	1.03
10-18	1.25	1.19	2.74	0.87	2.80	1.61	0.69
10-23	1.25	1.25	2.74	0.69	2.80	1.61	0.78
10-28	1.25	1.46	2.74	1.07	2.80	1.61	0.65
11-2	1.25	1.91	2.74	1.18	2.80	1.61	0.72
11-7	1.25	1.63	2.74	0.95	2.80	1.61	0.69

TABLE 240

FAT PARTITION OF FECES  
*Values in grams per day*

Date	Unsaponi- fiable	Neutral fat	Free fatty acids	Soap
9-18	1.01	0.29	0.26	1.84
9-23	1.17	0.29	0.29	1.87
9-28	1.01	0.21	0.23	1.54
10-3	0.95	0.21	0.20	1.38
10-8	1.19	0.03	0.29	1.20
10-13	1.26	0.06	0.36	1.20
10-18	1.04	0.33	0.29	1.06
10-23	0.90	0.35	0.25	0.86
10-28	1.19	0.16	0.33	1.12
11-2	1.01	0.46	0.33	1.20
11-7	1.26	0.36	0.34	0.68

The age given is the initial age at start of study. Dates given are first days of five-day balance periods



BARBARA  
FIGURE 359. Dental examination, age 112 months.

NITROGEN PARTITION OF URINE  
*Values in grams of nitrogen per day*

Date	Urine volume	Total nitrogen	Urea	Ammonia	Creatinine + Creatine	Creatinine	Uric acid
9-18	1155	9.246	7.909	0.267	0.328	0.207	0.141
9-19	1380	10.838	9.448	0.344	0.390	0.238	0.139
9-20	1230	9.888	8.384	0.376	0.338	0.199	0.150
9-21	1580	9.835	8.514	0.360	0.385	0.221	0.191
9-23	970	10.349	8.401	0.287	0.326	0.223	0.183
9-24	955	10.548	9.136	0.320	0.326	0.216	0.172
9-25	1205	9.957	7.294	0.294	0.346	0.198	0.172
9-26	1325	10.550	8.597	0.363	0.412	0.234	0.185
9-27	1060	9.680	8.564	0.298	0.306	0.218	0.200
9-28	850	10.672	8.428	0.342	0.343	0.202	0.196
9-29	1335	10.659	9.082	0.358	0.358	0.224	0.152
9-30	965	9.326	7.996	0.284	0.321	0.219	0.122
10-1	1070	9.671	8.448	0.274	0.286	0.206	0.125
10-2	1095	10.356	9.038	0.257	0.363	0.230	0.138
10-3	1170	10.905	9.677	0.319	0.377	0.240	0.140
10-4	1030	10.774	10.146	0.280	0.376	0.227	0.127
10-5	995	11.317	10.066	0.338	0.357	0.238	0.150
10-6	1150	11.487	10.027	0.333	0.359	0.228	0.154
10-7	1145	9.972	8.914	0.284	0.327	0.218	0.130
10-8	810	10.046	8.814	0.239	0.327	0.214	0.139
10-9	1020	10.270	9.069	0.317	0.358	0.215	0.123
10-10	1230	10.335	9.105	0.360	0.347	0.220	0.135
10-11	970	10.010	8.899	0.292	0.331	0.222	0.118
10-12	1120	10.962	9.492	0.378	0.344	0.214	0.149
10-13	1180	10.584	9.168	0.352	0.335	0.216	0.128
10-14	1125	10.220	9.055	0.325	0.324	0.207	0.136
10-15	1095	10.024	8.758	0.300	0.330	0.206	0.136
10-16	1123	9.730	8.166	0.318	0.349	0.229	0.120
10-17	1275	10.680	9.184	0.386	0.354	0.214	0.143
10-18	1052	10.062	8.778	0.374	0.307	0.218	0.142
10-19	985	11.112	9.977	0.355	0.332	0.223	0.132
10-20	1175	10.066	8.532	0.302	0.338	0.236	0.142
10-21	1350	10.672	9.370	0.326	0.350	0.243	0.146
10-22	1175	10.755	8.745	0.300	0.346	0.238	0.138
10-23	1045	10.517	8.945	0.363	0.369	0.226	0.134
10-24	1210	10.772	9.345	0.343	0.350	0.248	0.133
10-25	1095	10.403	8.942	0.326	0.328	0.202	0.143
10-26	1255	11.010	9.524	0.346	0.331	0.246	0.139
10-27	1120	10.335	8.945	0.286	0.323	0.209	0.139
10-28	1195	10.725	9.261	0.315	0.359	0.223	0.154
10-29	1150	10.280	8.927	0.316	0.372	0.245	0.127
10-30	1055	9.958	8.594	0.350	0.348	0.213	0.144
10-31	950	10.721	9.255	0.337	0.362	0.231	0.141
11-1	1215	10.899	9.233	0.352	0.357	0.229	0.145
11-2	1275	11.244	9.716	0.364	0.372	0.234	0.145
11-3	1260	11.559	10.008	0.327	0.338	0.248	0.154
11-4	1060	10.434	8.902	0.328	0.363	0.243	0.127
11-5	1295	10.530	8.975	0.280	0.349	0.246	0.142
11-6	1190	10.517	8.451	0.327	0.344	0.235	0.137
11-7	1280	10.764	9.448	0.302	0.346	0.235	0.145
11-8	1108	11.332	9.076	0.360	0.362	0.222	0.141
11-9	1235	10.773	9.530	0.340	0.341	0.232	0.135
11-10	1070	11.102	9.727	0.322	0.360	0.230	0.148
11-11	1162	10.231	9.046	0.306	0.316	0.230	0.142

The age given is the initial age at start of study. Urine volumes are in milliliters.

TABLE 242

Barbara  
111 months

## TITRABLE ACIDITY AND ORGANIC ACID IN URINE

*Values in milliequivalents per day*

Date	Titration acidity	pH	Total organic acid	Date	Titration acidity	pH	Total organic acid
9-18	9.3	6.62	32.1	10-16	16.6	6.44	29.3
9-19	18.4	6.19	28.8	10-17	15.5	6.66	37.7
9-20	19.5	5.80	29.1	10-18	19.2	6.31	32.8
9-21	13.6	6.61	25.3	10-19	17.8	6.43	29.8
—	—	—	—	10-20	12.6	6.97	31.6
9-23	12.4	6.72	29.4	10-21	12.9	6.70	33.1
9-24	17.1	6.43	26.7	10-22	9.0	6.77	31.6
9-25	13.3	6.61	26.3	10-23	21.3	6.22	36.8
9-26	15.4	6.50	27.2				
9-27	12.6	6.50	26.0	10-24	15.0	6.61	29.8
				10-25	16.0	6.61	29.0
9-28	19.8	6.21	27.4	10-26	12.2	6.63	38.3
9-29	10.0	6.80	30.8	10-27	14.9	6.50	30.2
9-30	15.2	6.36	23.1	10-28	12.4	6.62	33.0
10-1	12.8	6.60	24.0	10-29	15.4	6.48	28.2
10-2	4.3	6.98	29.0	10-30	17.0	6.27	34.4
10-3	21.0	6.20	26.6				
10-4	12.6	6.72	27.0	10-31	18.9	6.43	30.8
10-5	19.7	6.35	35.9	11-1	13.3	6.54	41.8
10-6	17.3	6.43	30.8	11-2	16.5	6.40	28.9
10-7	11.7	6.48	24.9	11-3	12.2	6.40	32.4
				11-4	17.2	6.40	26.3
10-8	6.9	6.90	31.0	11-5	9.7	6.70	29.5
10-9	17.0	5.14	31.6				
10-10	16.1	6.30	28.8	11-6	16.6	6.47	35.8
10-11	15.7	6.63	30.0	11-7	17.0	6.48	30.8
10-12	18.9	6.53	35.2	11-8	17.5	6.43	34.6
10-13	16.2	6.66	28.6	11-9	17.4	6.40	30.8
10-14	10.4	6.87	29.5	11-10	15.4	6.53	30.6
10-15	13.4	6.73	27.0	11-11	15.2	6.40	28.0

TABLE 243

Barbara  
111 months

## SALIVA CULTURE ESTIMATION OF CARIES ACTIVITY

Date	QUANTITATIVE*			QUALITATIVE†	COLOR REACTION TEST‡			
	Lacto- bacilli	Cocci	Yeast		hours after preparation			
					24	48	72	96
mo.-day	colonies per ml. of saliva							
9-22	300	0	600	+	0	0	4	4
10-23	0	50	12000	+	0	2	3	4
10-31	260	10	190	+	0	2	3	4
11-7	250	0	400	+	0	0	4	4
11-14	0	0	500	—	0	0	0	2

\* 0.2 ml. saliva to tomato agar plate.

† 1.0 ml. saliva in acid glucose broth.

‡ 0.2 ml. saliva into melted beef agar.

TABLE 244

Barbara  
111 monthsVOLUME, WEIGHT AND SULFUR PARTITION OF URINE  
*Values are averages per day*

Date	Volume	Specific gravity	Wet weight	Dry weight*	SULFUR PARTITION		
					Inorganic	Ethereal	Neutral
mo.-day	ml.		gm.	gm.	mg.	mg.	mg.
9-18†	1336	1.015	1356	41.8	—	—	—
9-23†	1103	1.018	1123	43.5	—	—	—
9-28†	1063	1.022	1087	44.9	586	36	64
10-3†	1098	1.022	1122	44.7	646	36	63
10-8†	1030	1.025	1056	44.9	607	39	68
10-13†	1160	1.028	1193	44.1	593	36	61
10-18†	1147	1.025	1176	45.7	624	40	66
10-23†	1145	1.024	1173	45.7	628	36	66
10-28†	1113	1.023	1139	45.9	622	42	90
11-2†	1216	1.021	1242	45.3	651	46	48
11-7†	1171	1.020	1194	46.6	—	—	—
11-7‡	—	—	—	—	653	36	50
11-8‡	—	—	—	—	646	46	52
11-9‡	—	—	—	—	653	40	79
11-10‡	—	—	—	—	626	44	58
11-11‡	—	—	—	—	630	45	49

\* Cryochem dried.

† Determined upon five-day composites and corrected for precipitate solubility.

‡ Determined upon daily urine collections and corrected for precipitate solubility.

TABLE 245

Barbara  
111 monthsNICKEL IN INTAKE, URINE, FECES\*  
*Values are averages per day*

Date	Intake	Urine	Feces	Date	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mo.-day	mg.	mg.	mg.
9-18	1.183	0.000	0.486	10-18	1.524	0.000	0.533
9-23	0.899	0.000	0.499	10-23	1.632	0.004	0.552
9-28	0.963	0.000	0.462	10-28	0.980	0.010	0.472
10-3	1.035	0.000	0.576				
10-8	1.438	0.010	0.606	11-2	0.873	0.000	0.594
10-13	0.527	0.005	0.456	11-7	1.165	0.021	0.308

The age given is the initial age at start of study. Dates given are first days of five-day balance periods.

\* Determined polarographically.



TABLE 245A

Barbara  
111 months

## CARBON IN INTAKE, URINE, FECES

*Values in grams per day*

Date	Intake	Urine	Feces	Date	Intake	Urine	Feces
9-18	—	—	—	10-18	189.8	7.9	—
9-23	189.8	7.4	11.1	10-23	189.8	8.4	8.2
9-28	189.8	8.0	9.1	10-28	189.8	8.4	8.6
10-3	189.8	8.4	8.5				
10-8	189.8	8.7	9.0	11-2	189.8	8.9	10.0
10-13	189.8	8.0	9.9	11-7	189.8	8.8	8.8

TABLE 246

Barbara  
111 monthsIRON, MANGANESE, COPPER, ALUMINUM, LEAD, TIN  
IN INTAKE, FECES\**Values in milligrams per day*

Date	IRON		MANGANESE		COPPER	
	Intake	Feces	Intake	Feces	Intake	Feces
9-18	10.94	7.92	2.00	1.65	2.64	2.56
9-23	10.28	8.32	1.82	1.77	2.22	2.05
9-28	9.80	9.18	2.22	1.81	4.24	1.63
10-3	12.53	6.97	1.98	1.92	3.65	1.55
10-8	14.04	10.04	2.22	1.83	3.52	2.61
10-13	11.49	7.72	2.12	2.09	3.50	1.63
10-18	12.18	—	2.14	—	6.11	—
10-23	12.48	7.98	2.18	2.20	4.14	1.74
10-28	11.05	7.62	2.13	2.25	4.60	2.35
11-2	10.26	7.23	1.76	1.73	2.38	1.70
11-7	9.03	4.96	1.77	1.36	2.76	1.33

	ALUMINUM		LEAD		TIN	
	Intake	Feces	Intake	Feces	Intake	Feces
9-18	4.40	2.36	0.58	0.51	1.33	1.40
9-23	3.80	2.18	0.56	0.50	1.52	1.56
9-28	2.85	3.64	0.52	0.37	1.79	1.34
10-3	3.38	2.37	0.52	0.39	3.32	2.23
10-8	2.43	2.33	0.62	0.89	1.54	2.22
10-13	1.98	1.85	0.45	0.25	0.92	1.02
10-18	3.50	—	0.67	—	0.77	—
10-23	2.71	1.88	0.62	0.31	0.72	0.68
10-28	3.02	2.67	0.52	0.22	0.70	0.64
11-2	3.24	1.59	0.66	0.30	0.75	0.70
11-7	2.14	1.40	0.52	0.23	0.76	0.56

\* Determined spectrographically by the method of Brody, James K. and Ewing, D. T. Spectrographic determination of some metallic elements in food and feces. *Indus. Engin. Chem. (Anal. Ed.)* 17: 627, 1945.

TABLE 247

Barbara  
111 months

COPPER, ZINC, MANGANESE IN INTAKE, URINE, FECES  
*Values are averages per day*

Date	COPPER*			ZINC*			MANGANESE		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake†	Urine*	Feces†
mo.-day	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
9-18	4.30	0.26	1.34	13.85	0.65	9.07	1.99	0.002	1.96
9-23	3.84	0.36	1.50	15.72	0.46	11.98	1.90	0.002	2.07
9-28	5.03	0.33	1.19	15.38	0.39	10.42	2.18	0.004	1.76
10-3	4.49	0.34	1.22	15.47	0.44	9.29	2.00	0.011	2.08
10-8	4.52	0.18	1.49	14.26	0.51	10.50	2.22	0.007	2.16
10-13	4.43	0.28	1.20	16.27	0.34	7.36	2.13	0.000	2.08
10-18	5.86	0.20	1.30	14.88	0.40	8.10	2.36	0.000	2.03
10-23	6.21	0.29	1.29	16.34	0.55	9.94	2.25	0.016	2.23
10-28	5.02	0.23	1.32	15.37	0.48	9.76	2.31	0.174	2.21
11-2	5.00	0.21	1.17	17.44	0.55	10.10	2.01	0.000	2.24
11-7	4.71	0.21	—	14.29	0.58	—	2.11	0.003	1.83

The age given is the initial age at start of study. Dates given are first days of five-day balance periods. Italic figures were omitted from calculations of averages given in Volume I.

\* Determined polarographically.

† Determined chemically.



FIGURE 360. BARBARA, age 148 months.



BARBARA

FIGURE 361. Actual size reproduction of roentgenogram of left hand.  
Chronological age 148 months.

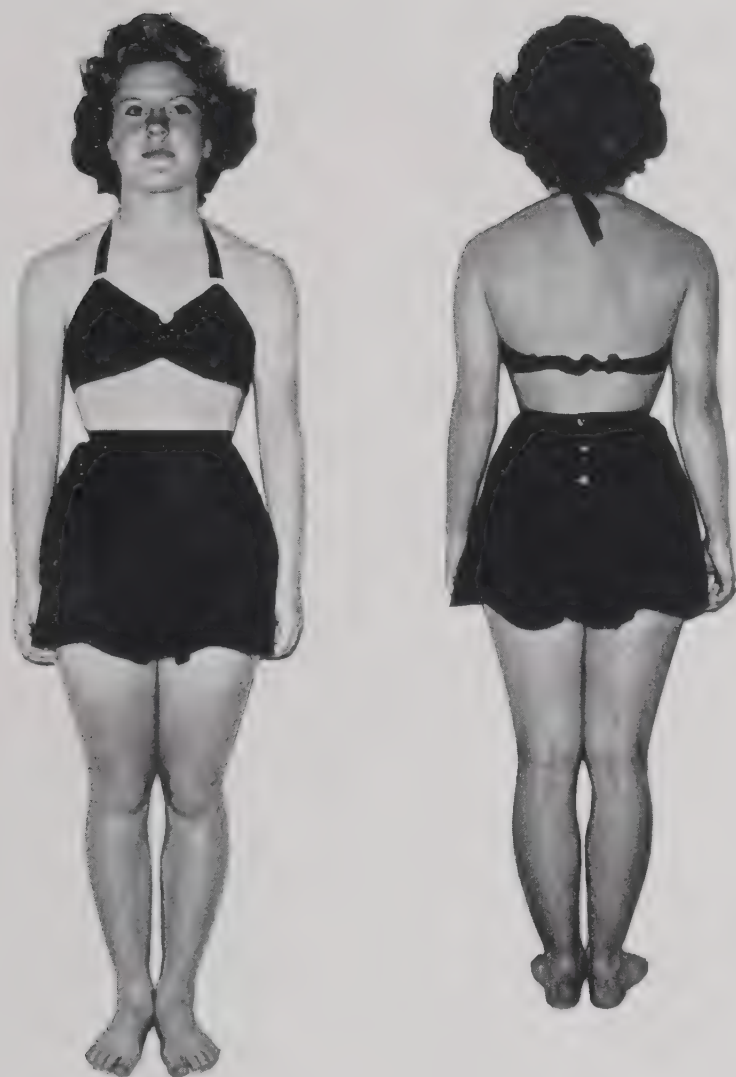


FIGURE 362. BARBARA, age 169 months.





BARBARA

FIGURE 363. Actual size reproduction of roentgenogram of left hand.  
Chronological age 169 months.



FIGURE 363A. BARBARA, 169 months.

## BILLY

Billy's parents were born in West Virginia. The mother came to Detroit with Billy when he was about three years old. The father stayed in West Virginia, keeping an older brother with him.

### Medical History

Billy was a full-term baby weighing 8 pounds, 4 ounces. Delivery was normal and he was breast-fed for one year. He walked alone when 12 months old. During early childhood Billy had measles, mumps and whooping cough without residual effects.

Billy was kept in a private boarding home until he was transferred to the Village when 92 months old. Pediatric examination at that time was negative except for "hypertrophy of tonsils." Schick, Dick, Mantoux and Wassermann tests were negative. He joined the children in the experimental group three months later, replacing Maynard. In December the pediatrician noted: "This boy is gaining nicely. Health has been excellent. Physical examination negative."

On January 1 Billy had a headache and his temperature was 102°. He was isolated, kept in bed and given terpin hydrate and creosote. The following day his temperature was normal and he ate well but had a cold and his bowels were loose. His appetite remained good and his temperature normal but he vomited his breakfast January 4 and his diet was restricted from January 3 to January 8. On the later date examination showed him to be "recovering nicely from recent respiratory infection. Chest shows only a few coarse râles."

### Psychological

Billy was tested when 98 months old. On the Stanford-Binet test his M.A. was 94 months, I.Q. 96; on the Arthur Point Scale his M.A. was 97 months, I.Q. 99; on the Goodenough test, M.A. 78 months.

Billy is a lively, out-going child who seems to have a happy nature. He was very enthusiastic about the tests, gurgled and chattered to himself and shouted with delight over the new ones.

He was reluctant to leave when they were finished and said that he wished there were a hundred more.

Billy did not start in school until he was 7 years old, at that time was entered in kindergarten for one semester and then placed in B-1. Upon entering school this fall he was placed back in B-1 again. When he was transferred to the Village November 1st, he did practically nothing during the first two weeks but improved greatly the last two weeks and is now trying 1-A work.

Billy appears to be a boy of normal average intelligence of the middle range. His ability seems to be on a good working level and he shows no evidence of any special disability. His reading is poor for his age and not up to what might be expected for his school experience but it is not bad enough to indicate a true reading disability. His irregular school experience could easily account for this retardation in reading.

### Endocrinological

Billy was 101 months old when classified by the endocrinologist, from the medical history, growth records, basal metabolism, physical examination and roentgenograms of hip, shoulder, knee, elbow, foot and hand.

Has gained 0.6 inch since September 11, a period of six months. Normal increment for this age and time is 1.0 inch. 1.4 inches below minimal normal height. Has two upper central incisors which show considerable spacing. Four lower incisors present. No structural endocrine abnormalities.

#### *Roentgenographic Study for Osseous Development*

Knee: Depression for the semilunar cartilage is present. This normally appears at eight. All other centers are present and normally developed.

Ankle: Epiphysis of the os calcis, which normally appears at eight, is making its appearance. All other centers are present and normally developed.

Diagnosis: Normal osseous development.

Classification: Endocrine normal.



TABLE 248

Billy

## RECUMBENT LENGTH AND WEIGHT

Age	RECUMBENT LENGTH		Weight	Age	RECUMBENT LENGTH		Weight
	Total	Stem			Total	Stem	
mo.-days	cm.	cm.	kg.	mo.-days	cm.	cm.	kg.
94-5	116.8	—	23.81	100-12	—	—	25.22
95-13	—	—	22.82	100-17	121.3	66.7	25.12
95-16	—	—	22.83	100-22	121.6	66.7	25.30
95-23	119.4	66.4	22.97	100-26	—	—	25.35
95-27	—	—	22.88	100-27	121.9	67.3	—
96-0	—	—	22.97	101-1	—	—	25.35
96-3	119.4	65.7	—	101-3	121.6	67.3	—
96-8	—	—	22.89	101-8	—	—	25.36
96-13	—	—	22.93	101-9	121.3	66.7	—
96-14	119.7	66.0	—	101-11	—	—	25.58
96-16	—	—	23.15	101-15	121.9	66.8	—
96-23	—	—	23.49	101-16	—	—	25.50
96-28	—	—	23.48	101-20	121.9	67.0	—
97-0	119.4	65.9	—	101-22	—	—	24.75
97-3	—	—	23.50	102-24	121.4	66.2	25.31
97-6	—	—	23.75	103-26	121.3	66.3	25.90
97-11	—	—	23.70	105-27	122.6	67.0	25.76
97-18	—	—	23.87	106-27	122.6	66.9	25.70
97-22	120.6	66.4	—	108-1	123.8	68.0	26.67
97-23	—	—	24.10	108-29	124.7	67.7	27.25
97-25	—	—	24.15	112-11	126.2	68.7	27.78
98-1	119.9	66.4	—	115-19	127.5	69.7	27.22
98-2	—	—	24.20	130-9	130.8	72.7	35.27
98-8	—	—	24.35	141-28	—	—	35.54
98-10	—	—	24.60	142-3	—	—	35.11
98-12	120.3	66.7	—	142-9	—	—	35.32
98-16	—	—	24.49	142-13	138.0	73.6	35.53
98-23	—	—	24.55	142-16	138.4	74.7	—
98-27	120.0	66.2	—	142-18	138.2	74.6	35.62
98-28	—	—	24.45	142-20	138.2	74.0	—
99-1	—	—	24.89	142-22	138.2	74.4	—
99-7	—	—	24.75	142-24	—	—	35.82
99-11	—	—	24.80	142-29	—	—	35.82
99-15	—	—	25.05	143-4	—	—	36.08
99-19	120.6	66.7	—	143-9	—	—	35.94
99-21	—	—	24.90	143-15	—	—	36.22
99-26	—	—	25.15	143-18	138.5	75.5	36.21
99-28	121.3	67.0	—	143-20	138.6	75.5	—
100-1	—	—	25.00	143-21	138.3	75.5	—
100-3	121.3	67.0	—	143-23	138.6	75.5	—
100-6	—	—	25.12	143-24	138.0	75.3	—
100-7	121.6	67.0	—	143-25	—	—	36.48

Actual values are averages of independent measurements by two workers. In calculating the smooth values given with the balance data the actual values given above were smoothed by three-point averaging and the resulting figures entered for their respective balance periods. Values for balance periods intervening between measurements were obtained by interpolation.

TABLE 249

Billy

## ANTHROPOMETRIC MEASUREMENTS

*Values in centimeters*

Age*	BREADTH			LENGTH		WIDTH	
	Biacro- mial	Intertro- chanteric	Inter- crystal	Tibia	Head	Chest	Head
95	20.7	21.0	19.5	25.6	17.7	21.5	14.6
96	23.0	20.5	18.0	25.9	17.4	20.0	14.7
98	22.5	21.0	20.0	25.8	17.2	20.7	14.7
99	21.9	21.0	20.0	26.2	17.6	20.2	14.7
100	22.0	21.5	19.8	26.3	17.6	20.4	14.7
101	23.0	21.3	20.7	26.8	17.5	20.7	14.8
102	23.0	21.3	19.5	26.7	17.7	21.0	14.8
103	23.8	21.3	19.5	26.5	17.3	20.4	14.6
104	23.0	21.4	19.3	26.9	17.7	20.5	14.8
106	23.6	21.3	19.2	27.5	17.6	21.3	14.7
107	23.7	21.5	19.2	27.4	17.6	20.5	14.8
108	23.2	21.5	20.0	27.2	17.7	21.0	14.8
109	24.2	21.2	19.6	27.4	17.8	20.0	15.0
112	23.0	22.0	20.0	27.5	17.5	20.4	14.7
116	24.0	21.4	20.0	28.7	17.3	—	14.7
130	25.1	—	21.4	30.2	18.0	22.5	15.0
142	24.4	—	21.3	30.5	17.6	23.0	15.1
143	25.5	—	22.0	31.0	17.5	22.8	15.0
144	26.1	—	22.0	30.6	17.6	23.0	15.0

Age*	DEPTH	CIRCUMFERENCES				
	Chest	Head	Chest	Thigh	Abdomen	Upper arm
95	15.3	51.2	60	35	57	17.0
96	14.7	51.6	60	34	54	16.5
98	15.6	51.9	60	35	56	17.5
99	14.8	51.2	61	36	55	17.9
100	14.0	51.8	61	36	59	18.0
101	14.5	51.6	62	36	59	18.3
102	15.0	51.3	61	36	54	17.5
103	15.0	51.8	61	35	58	18.0
104	14.6	52.0	63	37	58	18.0
106	15.3	51.5	64	36	56	17.8
107	14.5	51.8	63	36	57	17.5
108	15.3	52.0	63	38	58	18.0
109	15.0	52.0	64	39	57	18.7
112	15.5	52.5	64	38	57	18.3
116	—	52.2	64	37	57	18.5
130	17.0	52.4	70	42	59	20.0
142	17.4	53.0	72	43	60	21.0
143	17.0	52.5	69	43	62	20.5
144	16.5	53.0	71	45	60	21.0

\* Months.

TABLE 250

Billy

MEASUREMENTS OF THE BONES OF THE WRIST

AGE, months	95	100	116	142
CARPALS				
AREA, sq. mm.				
Hamate	90	93	111	147
Capitate	153	162	188	235
Lesser Multangular	14	22	44	80
Greater Multangular	10	16	40	102
Navicular	38	48	81	124
Lunate	29	32	51	88
Triangular	47	48	65	91
Pisiform				24
GREATEST DIAMETER, mm.				
Hamate	13	13	14	17
Capitate	18	19	20	23
Lesser Multangular	5	6	8	11
Greater Multangular	5	6	9	14
Navicular	8	9	12	15
Lunate	8	8	10	13
Triangular	9	9	11	12
Pisiform				5
Epiphyses				
1st Metacarpal	9	9	10	11
2nd Metacarpal	11	11	11	13
3rd Metacarpal	10	10	10	12
4th Metacarpal	8	9	9	11
ULNA				
DIAMETER, mm.				
Distal epiphysis	3	4	8	13
Distal metaphysis	12	12	14	16
RADIUS				
DIAMETER, mm.				
Distal epiphysis	22	23	25	28
WRIST AREA,* sq. mm.	1152	1216	1318	1440

\* Measured with the planimeter using Flory's landmarks (Monographs of the Society for Research in Child Development, Vol. I, No. 3, 1936).

TABLE 251

Billy

SKELETAL MATURATION

Values in months

Chrono-logical age	HAND				FOOT	ELBOW	KNEE	HIP	SHOULDER	AVERAGE
	B.B.G.*	Flory†	Kelly‡	Todd§	Todd§	Todd§	Todd§	Todd§	Todd§	Todd§
95	83	67	88	90	93	87	89	94	86	90
100	86	72	90	98	99	90	93	99	87	94
116	109	84	97	101	110	113	105	105	111	107
142	133	111	118	141	147	147	147	143	139	144

\* Baldwin, B. T., Busby, L. M., Garside, H. V. Anatomic Growth of Children. University of Iowa Studies in Child Welfare, vol. 4, no. 1, 1928.

† Flory, C. D. Osseous development in the hand as an index of skeletal development. Monographs of the Society for Research in Child Development, vol. 1, no. 3, 1936.

‡ Kelly, H. J. Anatomic age and its relation to stature. University of Iowa Studies in Child Welfare, vol. 12, no. 5, 1937.

§ Determined by T. Wingate Todd, C. C. Francis and Idell Pyle, Western Reserve University, Cleveland.

TABLE 252

Billy

## BASAL METABOLISM MEASUREMENTS

Age	Date	Sur- face area*	Respi- ration	Pulse rate	Body temper- ature	Blood pres- sure	Basal metab- olism
months	mo.-day	sq.m.	per min.	per min.	°F	S/D†	Cal./24 hr.
96	11-13	0.872	22	60	98.1	82/58	974
96	11-23	0.872	25	68	98.2	—	1018
96	12-4	0.873	33	60	98.0	96/66	1008
97	12-20	0.880	38	70	98.7	90/60	1008
98	1-20	0.894	30	64	98.4	92/58	998
98	1-31	0.903	22	66	98.0	91/64	977
99	2-15	0.899	22	73	98.6	92/62	991
100	3-8	0.910	19	74	97.6	94/72	1022
100	3-17	0.917	22	68	98.0	92/74	962
100	3-22	0.915	20	72	98.0	94/70	1018
100	3-26	0.918	19	67	98.0	92/69	1037
101	4-5	0.917	22	72	98.4	82/56	1054
101	4-10	0.921	23	74	98.6	92/70	1082
101	4-15	0.924	20	67	98.0	94/72	1008
101	4-21	0.922	19	67	97.8	97/74	1066
101	4-27	0.920	24	83	99.1	98/70	1078
101	5-3	0.926	23	78	98.4	94/70	1066
102	5-8	0.914	18	80	98.6	96/60	1085
142	9-19	1.17	27	64	98.0	92/60	1315
142	9-20	1.17	23	62	97.8	94/60	1310
143	11-2	1.17	20	66	98.8	92/70	1379
143	11-3	1.17	20	64	98.4	92/70	1340

\* DuBois formula.

† Systolic/Diastolic.

TABLE 253

Billy

## HEIGHT AND WEIGHT RECORD\*

Age	Height	Weight	Age	Height	Weight	Age	Height	Weight
months	inches	pounds	months	inches	pounds	months	inches	pounds
94	46 $\frac{1}{2}$	52 $\frac{3}{4}$	105	48 $\frac{1}{4}$	58 $\frac{1}{4}$	138	53	77
97	46 $\frac{3}{4}$	53 $\frac{1}{2}$	108	48 $\frac{1}{4}$	61	141	53 $\frac{1}{4}$	81 $\frac{1}{4}$
98	—	55 $\frac{1}{2}$	118	50	65			
102	47 $\frac{3}{4}$	56 $\frac{1}{4}$	124	51	65 $\frac{3}{4}$	145	54	88
103	47 $\frac{3}{4}$	57	128	51 $\frac{1}{2}$	68 $\frac{3}{4}$	150	54 $\frac{1}{2}$	83 $\frac{1}{2}$

\* Clinical. See also table of recumbent lengths and weights.



TABLE 254

Billy

BLOOD DETERMINATIONS

Age	Date	Red cells	Hemo- globin	WHITE BLOOD CELLS					
				Total	Poly- morpho- nuclears	Lym- pho- cytes	Mono- cytes	Eosino- philes	
months	mo.-day	millions	gm./100 cc.	per c. mm.	per cent	per cent	per cent	per cent	
95	10-12	4.28	13*	9900	50	36	12	2	
100	3-14	4.46	12*	5950	33	51	11	5	
116	7-9	5.05	11*	6800	40	47	10	3	
142§	9-14	5.04	14†	6500‡	56	44	—	—	
142	9-14	Hematocrit		RED BLOOD CELL MEASUREMENTS					
				Volume		Diameter		Thickness	
		per cent		c.μ	μ	μ			
		43		86	7.3	2.1			
		MINERALS (mg. per 100 ml.)							
142	9-14	SERUM					ERYTHROCYTES		
		Cal- cium	Phos- phorus	So- dium	Potas- sium	Chlor- ine	So- dium	Potas- sium	Chlor- ine
		11.4	6.64	322	19.4	366	7	428	152

\* Haden-Hauser hemoglobinometer.  
† Evelyn photoelectric colorimeter.  
‡ Oxalate added.  
§ Venous sample.



BILLY

FIGURE 364. Actual size reproduction of roentgenogram of left hand.  
Chronological age 95 months.



## BILLY

FIGURE 365. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 95 months.



BILLY

FIGURE 366. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 95 months.





BILLY

FIGURE 367. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 95 months.



BILLY

FIGURE 368. Actual size reproduction of roentgenogram of left hip.  
Chronological age 95 months.



## BILLY

FIGURE 369. Actual size reproduction of roentgenogram of left knee.  
Chronological age 95 months.



## BILLY

FIGURE 370. Actual size reproduction of roentgenogram of left knee.  
Chronological age 95 months.





BILLY

FIGURE 371. Actual size reproduction of roentgenogram of left foot.  
Chronological age 95 months.



BILLY

FIGURE 372. Actual size reproduction of roentgenogram of left foot.  
Chronological age 95 months.

TABLE 255

Billy  
95 months

FOOD INTAKE  
*Values in grams per day*

Food	DATE					
	11-4	12-4	2-7	3-3	3-18	3-23
	to 12-4	to 2-7	to 3-3	to 3-18	to 3-23*	to 5-12‡
Apple	100	100	100	100	100	100
Banana	100	100	100	100	100	100
Beef, lean	100	100	100	100	100	100
Bread, white	70	70	70	70	70	70
Bread, whole wheat	30	30	30	30	30	30
Butter	30	40	40	40	43	43
Cabbage	25	25	25	25	25	25
Carrot	25	25	25	25	25	25
Cheese, American	15	15	15	15	15	15
Corn flakes	15	15	15	15	15	15
Egg, whole	50	50	50	50	50	50
Graham cracker	18	18	18	18	18	18
Lettuce	20	20	20	20	20	20
Milk, evaporated	—	400	400†	400†	400†	400†
Milk, fluid	400	400	400†	400†	400†	400†
Orange concentrate	50	50	50	—	—	—
Orange juice, fresh	—	—	—	50	50	50
Peanut butter	16	16	16	16	16	16
Potato	70	70	70	70	70	70
Salt	2	2	2	2	2	2
Shredded wheat	15	15	15	15	15	15
Spinach	—	—	—	100	—	—
Sugar (average)	9	8	12	13	11	11
Tomato juice	60	60	60	60	60	60
Water (average)	358	481	591	477	512	529

\* Oxalic acid, 0.7 gm. and calcium (as acetate) 0.058 gm. additional.  
† Irradiated. Evaporated milk diluted 1:1.  
‡ Adrenal cortex extract, 3 cc. hypodermically, April 7, 9, 12, 14, 17, 19, 22, 24.

TABLE 256

Billy  
96 months

PEDOMETER MEASUREMENTS

Date	Miles	Date	Miles	Date	Miles	Date	Miles	Date	Miles
11-16	3 <sup>1</sup> / <sub>16</sub>	12-14	2	1-19	2 <sup>7</sup> / <sub>8</sub>	2-16	2 <sup>1</sup> / <sub>16</sub>	3-29	5 <sup>1</sup> / <sub>2</sub>
11-17	1 <sup>1</sup> / <sub>2</sub>	12-15	1 <sup>5</sup> / <sub>8</sub>	1-25	3 <sup>1</sup> / <sub>2</sub>	2-29	4	4-4	2
11-23	1 <sup>1</sup> / <sub>16</sub>	12-21	3 <sup>11</sup> / <sub>16</sub>	1-26	2 <sup>7</sup> / <sub>16</sub>	3-1	3 <sup>3</sup> / <sub>8</sub>	4-12	4 <sup>3</sup> / <sub>4</sub>
11-24	2 <sup>3</sup> / <sub>16</sub>	12-22	2	2-1	2 <sup>5</sup> / <sub>8</sub>	3-7	2 <sup>3</sup> / <sub>8</sub>	4-18	4 <sup>1</sup> / <sub>2</sub>
11-30	1 <sup>1</sup> / <sub>16</sub>	12-28	1 <sup>3</sup> / <sub>4</sub>	2-2	2 <sup>1</sup> / <sub>2</sub>	3-8	2 <sup>1</sup> / <sub>2</sub>	4-19	4 <sup>3</sup> / <sub>8</sub>
12-1	1 <sup>1</sup> / <sub>16</sub>	12-29	2 <sup>1</sup> / <sub>2</sub>	2-8	3 <sup>3</sup> / <sub>4</sub>	3-14	2 <sup>3</sup> / <sub>8</sub>	5-2	2 <sup>3</sup> / <sub>4</sub>
12-7	1 <sup>1</sup> / <sub>16</sub>	1-12	2	2-9	3 <sup>1</sup> / <sub>2</sub>	3-22	1 <sup>1</sup> / <sub>2</sub>	5-9	2 <sup>3</sup> / <sub>8</sub>
12-8	1 <sup>1</sup> / <sub>16</sub>	1-18	3 <sup>1</sup> / <sub>8</sub>	2-15	3 <sup>1</sup> / <sub>8</sub>	3-28	4	5-10	1

New Haven pedometers were set at 27 inches and worn hooked to belt during hours awake.

TABLE 257

Billy  
95 months

## BODY LENGTH AND WEIGHT—INTAKE AND ELIMINATION

Date	Recumbent length*	Weight*	INTAKE			AVERAGE DAILY HEAT OF COMBUSTION			FECES				
			AVERAGE DAILY						AVERAGE DAILY			Laxation rate†	Elimination time§
			Dry wt.*	Total water†	Fat	In-take	Urine	Feces	Wet wt.	Dry wt.*	Fat		
mo.-day	cm.	kg.	gm.	gm.	gm.	Cal.	Cal.	Cal.	gm.	gm.	gm.		hours
11-4	119	22.88	363	1214	71.0	1893	65	79	124.5	20.0	2.5	1.8	11
11-9	119	22.89	368	1164	71.0	1913	75	54	112.6	12.0	1.6	2.0	10
11-14	119	22.94	363	1202	71.0	1892	59	66	129.8	16.0	1.9	2.2	12
11-19	120	22.91	365	1250	71.0	1899	71	64	114.0	13.0	1.5	1.6	25
11-24	120	22.93	362	1233	71.0	1887	75	67	103.0	15.0	1.7	1.2	25
11-29	120	22.99	359	1236	71.0	1877	79	51	99.0	15.0	1.6	1.2	26
12-4	120	23.19	438	1377	99.6	2281	68	87	130.8	18.0	2.7	1.4	25
12-9	120	23.37	434	1303	99.6	2265	82	78	123.2	16.0	2.7	1.4	25
12-14	120	23.49	437	1376	99.6	2278	78	96	117.8	16.0	2.4	1.4	10
12-19	120	23.58	437	1411	99.6	2279	77	84	125.2	17.0	2.9	1.4	25
12-24	120	23.65	445	1425	99.6	2309	74	83	131.6	15.0	2.5	1.6	26
12-29	120	23.77	437	1584	99.6	2280	93	109	228.6	22.0	3.1	3.2	25
1-8	120	24.04	437	1495	99.6	2277	94	132	204.4	28.0	4.4	2.8	10
1-13	120	24.15	438	1565	99.6	2284	86	122	165.0	26.0	4.2	1.6	11
1-18	120	24.23	438	1510	99.6	2282	70	113	160.0	24.0	3.9	1.4	26
1-23	120	24.38	436	1559	99.6	2275	71	108	159.8	24.0	3.7	1.4	24
1-28	120	24.48	436	1474	99.6	2275	75	112	146.2	19.0	3.1	1.6	33
2-2	120	24.55	438	1543	99.6	2285	76	88	129.2	17.0	2.9	1.6	25
2-7	120	24.50	440	1558	99.6	2280	74	123	150.2	25.0	4.2	1.8	10
2-12	120	24.63	445	1562	99.6	2303	74	114	146.4	19.0	3.0	1.8	24
2-17	120	24.70	444	1576	99.6	2297	80	87	152.2	19.0	3.4	1.8	11
2-22	120	24.81	445	1642	99.6	2301	65	131	177.2	28.0	4.6	1.8	12
2-27	120	24.87	443	1575	99.6	2295	72	94	138.2	18.0	2.7	1.6	24
3-3	121	24.92	445	1439	102.7	2241	82	126	159.0	27.0	4.2	1.8	10
3-8	121	25.03	450	1568	102.7	2261	77	100	149.4	25.0	3.6	1.8	12
3-13	121	25.02	450	1588	102.7	2261	64	96	111.6	16.0	2.5	1.4	25
3-18	121	25.09	428	1521	103.2	2252	67	86	139.0	19.0	3.4	2.0	10
3-23	121	25.11	427	1537	103.2	2278	81	110	142.4	24.0	4.4	1.8	11
3-28	121	25.15	418	1540	103.2	2243	73	89	105.6	20.0	3.4	1.6	12
4-2	122	25.21	417	1347	103.2	2239	77	97	122.4	21.0	3.3	1.4	10
4-7	122	25.26	418	1461	103.2	2244	75	96	154.0	18.0	2.6	1.8	11
4-12	122	25.33	423	1420	103.2	2264	79	127	135.6	27.0	4.3	1.4	25
4-17	122	25.35	422	1527	103.2	2260	76	106	145.8	26.0	4.2	1.4	24
4-22	122	25.43	418	1411	103.2	2244	80	128	160.0	27.0	4.2	1.8	25
4-27	122	25.48	412	1717	103.2	2216	84	110	183.6	21.0	3.3	2.0	24
5-2	122	25.28	421	1595	103.2	2253	75	132	192.4	29.0	4.7	1.8	25

The age given is the initial age at start of study. Dates given are first days of five-day balance periods.

\* See Table 248 for actual values and method of smoothing.

† Based on alcohol-dried food and oven-dried feces.

‡ Drinking water plus water in food.

§ Average number of defecations per day.

¶ Elapsed time between ingestion and defecation of marker used to separate feces of five-day periods.

# See case history, page 810, for explanation for missing period.



TABLE 258

Billy  
95 monthsNITROGEN AND NEGATIVE MINERALS IN INTAKE, URINE, FECES  
*Values are averages per day*

Date	NITROGEN			PHOSPHORUS			CHLORINE			SULFUR		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo. day	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
11-4	10.32	8.67	1.28	1076	723	500	3412	2898	73	692	591	115
11-9	10.32	9.22	0.70	1076	598	303	3412	3336	65	692	601	63
11-14	10.32	9.01	1.05	1076	620	330	3412	3198	76	692	578	77
11-19	10.32	9.33	0.96	1076	550	348	3412	3250	82	692	770	77
11-24	10.32	9.30	0.97	1076	580	359	3412	3240	69	692	598	76
11-29	10.32	9.42	0.94	1076	690	319	3412	3234	61	692	602	76
12-4	12.28	10.06	1.28	1484	735	507	3826	3900	115	824	648	108
12-9	12.28	10.07	1.13	1484	679	416	3826	3245	49	824	646	76
12-14	12.28	10.50	1.25	1484	811	495	3826	3120	50	824	703	100
12-19	12.28	10.42	1.07	1484	810	430	3826	3480	57	824	682	86
12-24	12.28	10.31	1.05	1484	765	433	3826	3660	48	824	687	87
12-29	12.28	11.03	1.44	1484	718	472	3826	3840	136	824	717	121
***												
1-8	12.28	10.58	1.38	1484	881	580	3826	3240	133	824	717	135
1-13	12.28	9.73	1.44	1484	842	545	3826	3360	130	824	677	124
1-18	12.28	9.20	1.35	1484	766	471	3826	3480	135	824	612	119
1-23	12.28	9.43	1.37	1484	718	444	3826	3612	117	824	635	108
1-28	12.28	10.13	1.22	1484	847	475	3826	3768	148	824	654	114
2-2	12.28	10.32	1.17	1484	908	403	3826	3516	53	824	669	93
2-7	12.28	10.26	1.30	1484	902	535	3826	3546	80	824	675	133
2-12	12.28	10.23	1.26	1484	896	504	3826	3630	91	824	679	118
2-17	12.28	10.45	1.22	1484	866	360	3826	3420	68	824	685	90
2-22	12.28	10.12	1.28	1484	894	521	3826	3420	123	824	674	133
2-27	12.28	10.03	1.11	1484	870	405	3826	3516	159	824	664	95
3-3	12.64	10.31	1.37	1583	956	518	4369	4182	129	858	712	144
3-8	12.64	10.83	1.26	1583	906	404	4369	4056	98	858	710	114
3-13	12.64	10.12	1.16	1583	906	462	4369	3720	96	858	667	109
3-18	12.35	10.05	1.18	1496	980	363	3832	3594	100	830	682	89
3-23	12.35	10.11	1.15	1496	906	461	3832	3690	114	830	688	110
3-28	12.35	9.97	0.99	1496	902	435	3832	3708	74	830	688	90
4-2	12.35	10.21	1.02	1496	883	506	3832	3607	61	830	690	100
4-7	12.35	10.02	1.20	1496	848	442	3832	3660	103	830	628	101
4-12	12.35	10.47	1.22	1496	926	622	3832	3744	116	830	678	137
4-17	12.35	10.54	1.21	1496	964	490	3832	3450	172	830	685	118
4-22	12.35	10.55	1.24	1496	896	568	3832	3906	146	830	714	133
4-27	12.35	10.85	1.35	1496	818	511	3832	3534	146	830	736	108
5-2	12.35	10.27	1.39	1496	893	620	3832	3636	157	830	685	136

\* See footnotes to Table 257.

TABLE 259

Billy  
95 months

POSITIVE MINERALS IN INTAKE, URINE, FECES  
*Values are averages per day*

Date	CALCIUM			MAGNESIUM			SODIUM			POTASSIUM		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
11-4	767	100	685	266	77	202	2176	1764	67	2440	2112	436
11-9	767	122	479	266	72	123	2176	2018	47	2440	1760	349
11-14	767	98	618	266	67	168	2176	1948	81	2440	1780	443
11-19	767	89	620	266	70	166	2176	2016	66	2440	1914	416
11-24	767	92	667	266	48	180	2176	1892	47	2440	1875	376
11-29	767	73	579	266	70	163	2176	1931	67	2440	1720	366
12-4	1259	90	1050	315	62	224	2445	2466	68	3013	2180	440
12-9	1259	92	1010	315	70	210	2445	2125	50	3013	2246	429
12-14	1259	84	1097	315	72	227	2445	2148	56	3013	2340	492
12-19	1259	98	967	315	78	197	2445	2239	73	3013	2280	457
12-24	1259	94	1037	315	94	197	2445	2292	62	3013	2360	433
12-29	1259	106	1089	315	114	228	2445	2511	241	3013	2290	604
***												
1-8	1259	69	1053	315	73	215	2445	1983	171	3013	1980	683
1-13	1259	87	1183	315	73	236	2445	2241	138	3013	2260	577
1-18	1259	104	1054	315	91	203	2445	2194	105	3013	2120	480
1-23	1259	113	1109	315	98	209	2445	2267	113	3013	2348	497
1-28	1259	111	1063	315	83	201	2445	2410	79	3013	2320	454
2-2	1259	92	1036	315	78	199	2445	2217	35	3013	2306	409
2-7	1259	88	1079	315	86	209	2445	2311	65	3013	2386	499
2-12	1259	84	1055	315	86	205	2445	2324	77	3013	2225	441
2-17	1259	89	1031	315	87	204	2445	2127	75	3013	2310	426
2-22	1259	71	1024	315	86	202	2445	2250	118	3013	2129	465
2-27	1259	77	956	315	77	180	2445	2236	53	3013	2232	415
3-3	1317	81	1085	385	106	238	2814	2741	93	3358	2455	446
3-8	1317	79	1045	385	91	232	2814	2608	102	3358	2549	411
3-13	1317	72	1073	385	92	243	2814	2356	30	3358	2492	350
3-18	1324	66	1075	331	90	197	2438	2224	72	3249	2471	430
3-23	1267	78	1006	331	90	198	2438	2288	65	3249	2306	390
3-28	1267	81	988	331	88	181	2438	2306	26	3249	2224	349
4-2	1267	78	978	331	83	185	2438	2234	42	3249	2486	386
4-7	1267	80	1012	331	82	198	2438	2277	86	3249	2357	434
4-12	1267	86	1071	331	95	204	2438	2290	52	3249	2475	430
4-17	1267	94	1033	331	95	189	2438	2108	63	3249	2438	419
4-22	1267	107	1005	331	77	193	2438	2287	107	3249	2387	426
4-27	1267	72	1027	331	66	214	2438	2009	132	3249	2399	556
5-2	1267	71	1087	331	68	215	2438	2196	167	3249	2226	554

\* See footnotes to Table 257.

TABLE 260

Billy  
96 months

## COMPLEX CARBOHYDRATES IN INTAKE AND FECES

*Values in grams per day*

Date	LIGNIN		CELLULOSE		HEMICELLULOSE		
	Intake	Feces	Intake	Feces	INTAKE		Feces
					Total	Stable	
11-9	1.33	1.03	2.32	0.70	2.47	1.89	0.68
11-14	1.33	1.35	2.32	0.84	2.47	1.89	0.86
11-19	1.29	1.45	2.27	0.69	2.28	1.68	0.64
11-29	1.29	1.34	2.27	0.75	2.28	1.68	0.85
12-4	1.33	1.15	2.32	0.85	2.47	1.89	1.00
12-9	1.33	1.22	2.32	0.67	2.47	1.89	0.85
12-14	1.33	1.32	2.32	0.66	2.47	1.89	0.88
12-19	1.33	1.56	2.32	0.87	2.47	1.89	0.73
12-24	1.33	1.03	2.32	0.84	2.47	1.89	0.63
12-29	1.33	1.40	2.32	1.36	2.47	1.89	1.05
***							
1-8	1.33	1.70	2.32	1.52	2.47	1.89	1.27
1-13	1.33	2.02	2.32	1.23	2.47	1.89	1.30
1-18	1.29	1.68	2.27	1.16	2.28	1.68	1.27
1-23	1.33	1.76	2.32	1.20	2.47	1.89	1.24
1-28	1.33	1.52	2.32	0.63	2.47	1.89	0.93
2-2	1.33	1.18	2.32	0.80	2.47	1.89	0.91
2-7	1.33	1.80	2.32	1.15	2.47	1.89	1.18
2-12	1.33	1.32	2.32	0.75	2.47	1.89	1.00
2-17	1.33	1.35	2.32	0.95	2.47	1.89	1.02
2-22	1.33	1.85	2.32	1.46	2.47	1.89	1.28
2-27	1.33	1.27	2.32	0.91	2.47	1.89	1.04
3-3	1.46	1.88	2.61	1.41	2.61	1.98	1.27
3-8	1.46	1.71	2.61	1.31	2.61	1.98	1.14
3-13	1.46	1.20	2.61	0.70	2.61	1.98	0.81
3-18	1.33	1.17	2.32	0.40	2.47	1.89	0.92
3-23	1.33	1.74	2.32	1.11	2.47	1.89	1.13
3-28	1.36	1.51	2.37	0.95	2.65	2.09	1.02
4-2	1.33	1.50	2.32	1.17	2.47	1.89	0.83
4-7	1.33	1.32	2.32	0.96	2.47	1.89	0.86
4-12	1.33	2.30	2.32	1.36	2.47	1.89	1.52
4-17	1.33	2.10	2.32	1.06	2.47	1.89	1.40
4-27	1.33	1.64	2.32	0.76	2.47	1.89	0.80
5-2	1.33	1.82	2.32	1.11	2.47	1.89	1.29

\* See case history, page 810.

TABLE 261

Billy  
100 months

## NITROGEN PARTITION OF URINE

*Values in grams of nitrogen per day*

Date	Total nitrogen	Urea	Ammonia	Creatinine + Creatine	Creatinine	Uric acid
3-28	9.22	8.478	0.282	0.290	0.208	0.099
3-29	9.26	8.412	0.268	0.316	0.216	0.122
3-30	10.02	9.006	0.294	0.394	0.238	0.124
3-31	10.29	9.377	0.343	0.385	0.205	0.124
4-1	11.08	10.521	0.379	0.425	0.233	0.112
4-2	9.79	8.548	0.372	0.347	0.225	0.137
4-3	10.38	9.485	0.315	0.386	0.208	0.150
4-4	10.63	9.550	0.270	0.362	0.214	0.148
4-5	10.56	9.690	0.270	0.404	0.231	0.161
4-6	9.70	9.195	0.285	0.376	0.235	0.139
4-7	11.55	9.612	0.308	0.321	0.210	0.149
4-8	8.86	8.080	0.260	0.289	0.210	0.134
4-9	10.07	9.247	0.253	0.320	0.223	0.134
4-10	7.26	6.549	0.151	0.269	0.170	0.114
4-11	12.38	10.695	0.325	0.449	0.273	0.168
4-12	10.46	9.432	0.248	0.381	0.251	0.147
4-13	10.46	9.330	0.330	0.396	0.229	0.143
4-14	10.25	9.295	0.305	0.381	0.233	0.135
4-15	10.40	9.355	0.265	0.361	0.231	0.147
4-16	10.76	9.733	0.323	0.395	0.228	0.145
4-17	10.91	9.469	0.291	0.436	0.255	0.149
4-18	10.79	9.862	0.290	0.374	0.253	0.141
4-19	10.70	9.774	0.300	0.377	0.238	0.152
4-20	9.88	9.041	0.261	0.315	0.236	0.136
4-21	10.40	9.474	0.316	0.315	0.231	0.140
4-22	7.89	7.252	0.208	0.247	0.168	0.116
4-23	11.77	10.740	0.367	0.430	0.313	0.144
4-24	11.97	10.830	0.204	0.416	0.314	0.170
4-25	10.25	9.088	0.382	0.347	0.266	0.147
4-26	10.87	9.700	0.519	0.333	0.268	0.137
4-27	11.73	10.259	0.475	0.352	0.255	0.143
4-28	11.16	9.862	0.426	0.373	0.271	0.162
4-29	10.79	9.510	0.336	0.383	0.242	0.161
4-30	10.04	9.351	0.383	0.391	0.257	0.118
5-1	10.51	9.468	0.398	0.354	0.244	0.074
5-2	10.22		0.340	0.333	0.257	0.167
5-3	10.32	9.613	0.367	0.351	0.244	0.162
5-4	10.87	9.626	0.348	0.343	0.232	0.157
5-5	9.80	9.047	0.319	0.330	0.251	0.152
5-6	10.16	9.194	0.358	0.306	0.232	0.125
5-7	10.17	8.805	0.365	0.320	0.232	0.152
5-8	9.67	8.653	0.265	0.299	0.285	0.175
5-9	9.53	8.568	0.216	0.291	0.272	0.156
5-10	11.45	10.284	0.288	0.395	0.279	0.179

The age given is the initial age at start of study.



TABLE 262

Billy  
95 months

IRON IN INTAKE, URINE AND FECES  
*Values are averages per day*

Date	Intake	Urine	Feces	Date	Intake	Urine	Feces	Date	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mo.-day	mg.	mg.	mg.	mo.-day	mg.	mg.	mg.
11-4	8.19	0.17	7.95	1-8	8.43	0.27	7.91	3-8	9.44	0.24	6.75
11-9	8.19	0.14	4.23	1-13	8.43	0.12	7.38	3-13	9.44	0.46	5.38
11-14	8.19	0.03	5.96	1-18	8.43	0.15	6.57	3-18	8.46	0.38	5.80
11-19	8.19	0.12	5.40	1-23	8.43	0.10	6.57	3-23	8.46	0.46	7.23
11-24	8.19	0.16	6.90	1-28	8.43	0.21	5.46	3-28	8.46	0.47	6.10
11-29	8.19	0.22	6.34	2-2	8.43	0.08	4.80	4-2	8.46	0.18	7.22
12-4	8.43	0.10	6.52	2-7	8.46	0.04	7.38	4-7	8.46	0.04	5.40
12-9	8.43	0.11	5.56	2-12	8.46	0.10	5.37	4-12	8.46	0.00	9.28
12-14	8.43	0.02	6.04	2-17	8.46	0.15	5.72	4-17	8.46	0.16	7.80
12-19	8.43	0.24	5.91	2-22	8.46	0.04	7.46	4-22	8.46	0.08	7.29
12-24	8.43	0.22	4.95	2-27	8.46	0.13	5.13	4-27	8.46	0.07	6.77
12-29	8.43	0.08	7.04	3-3	9.44	0.08	9.18	5-2	8.46	0.08	8.12
§§§											

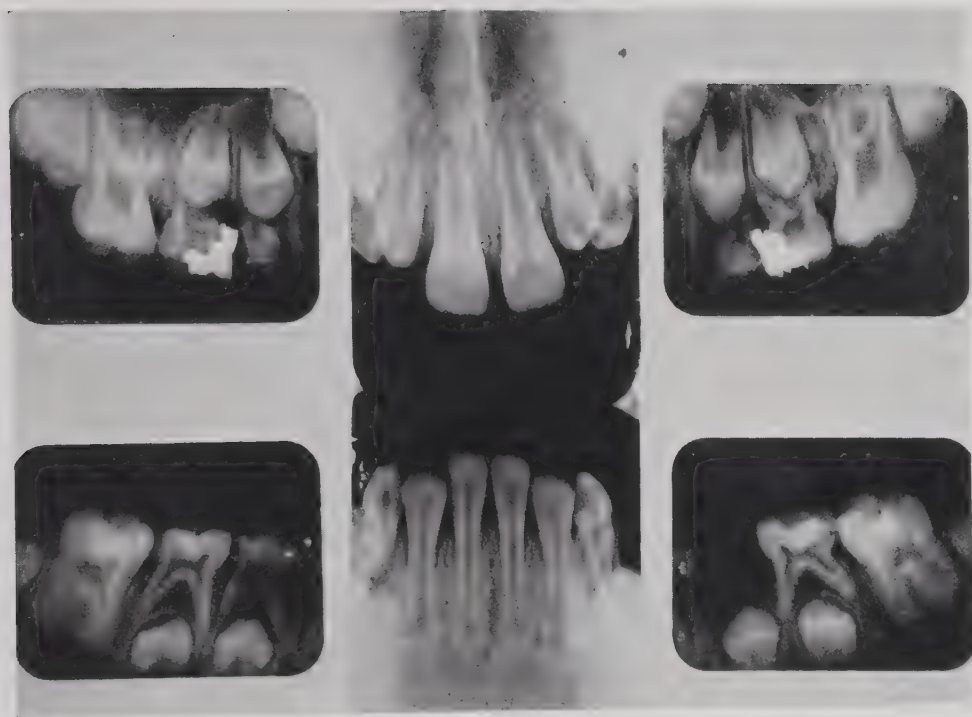
The age given is the initial age at start of study. Dates given are first days of five-day balance periods.  
§§§ See case history, page 810 for explanation for missing period.

TABLE 263

Billy  
101 months

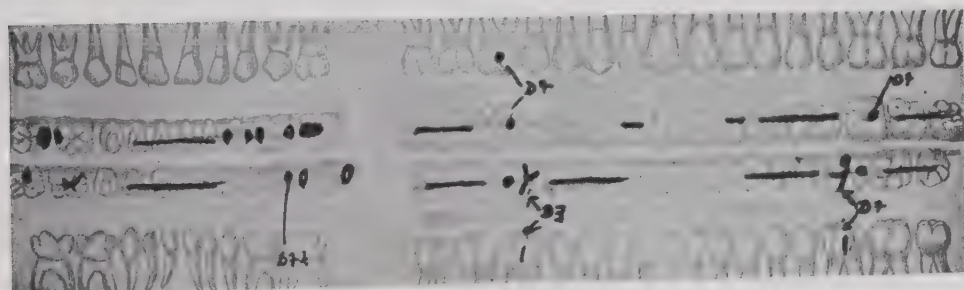
TEMPERATURE AND PULSE

Date	Temper- ature	Pulse	Date	Temper- ature	Pulse	Date	Temper- ature	Pulse
4-7	98.6	74	4-20	98.2	71	5-2	99.4	84
4-8	98.2	72	4-21	97.8	67	5-3	98.4	78
4-9	98.0	74	4-22	98.2	72	5-4	99.0	92
4-10	98.6	74	4-23	98.2	72	5-5	98.6	88
4-11	98.7	76	4-24	98.4	80	5-6	99.4	84
4-12	98.2	76	4-25	100.4	108	5-7	98.6	83
4-13	98.2	76						
4-14	98.2	76	4-26	100.2	100	5-8	98.6	80
4-15	98.0	67	4-27	99.1	82	5-9	99.2	88
4-16	98.1	78	4-28	99.0	88	5-10	98.8	92
4-17	98.6	68	4-29	99.4	88	5-11	100.0	92
4-18	98.4	72	4-30	99.0	78	5-12	99.4	80
4-19	98.6	72	5-1	99.2	100	5-13	100.4	88



BILLY

FIGURE 373. Roentgenograms of teeth, age 97 months.



BILLY

FIGURE 374. Dental examination, age 97 months.



BILLY.

FIGURE 375. Actual size reproduction of roentgenogram of jaws.  
Chronological age 97 months.



## BILLY

FIGURE 376. Actual size reproduction of roentgenogram of left hand.  
Chronological age 100 months.





## BILLY

FIGURE 377. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 100 months.



## BILLY

FIGURE 378. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 100 months.



BILLY

FIGURE 379. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 100 months.



BILLY

FIGURE 380. Actual size reproduction of roentgenogram of left hip.  
Chronological age 100 months.





## BILLY

FIGURE 381. Actual size reproduction of roentgenogram of left knee.  
Chronological age 100 months.



## BILLY

FIGURE 382. Actual size reproduction of roentgenogram of left knee.  
Chronological age 100 months.



BILLY

FIGURE 383. Actual size reproduction of roentgenogram of left foot.  
Chronological age 100 months.



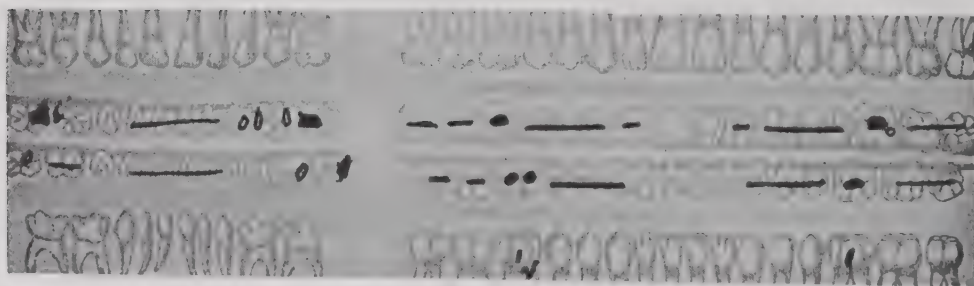
BILLY

FIGURE 384. Actual size reproduction of roentgenogram of left foot.  
Chronological age 100 months.





FIGURE 385. BILLY, age 98 months.



BILLY

FIGURE 386. Dental examination, age 102 months.



BILLY

FIGURE 387. Actual size reproduction of roentgenogram of left hand.  
Chronological age 116 months.



## BILLY

FIGURE 388. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 116 months.



## BILLY

FIGURE 389. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 116 months.





## BILLY

FIGURE 390. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 116 months.



BILLY

FIGURE 391. Actual size reproduction of roentgenogram of left hip.  
Chronological age 116 months.



## BILLY

FIGURE 392. Actual size reproduction of roentgenogram of left knee.  
Chronological age 116 months.



BILLY

FIGURE 393. Actual size reproduction of roentgenogram of left knee.  
Chronological age 116 months.





BILLY

FIGURE 394. Actual size reproduction of roentgenogram of left foot.  
Chronological age 116 months.



BILLY

FIGURE 395. Actual size reproduction of roentgenogram of left foot.  
Chronological age 116 months.

## ROENTGENOGRAMS OF PROGRESS OF BARIUM MEAL

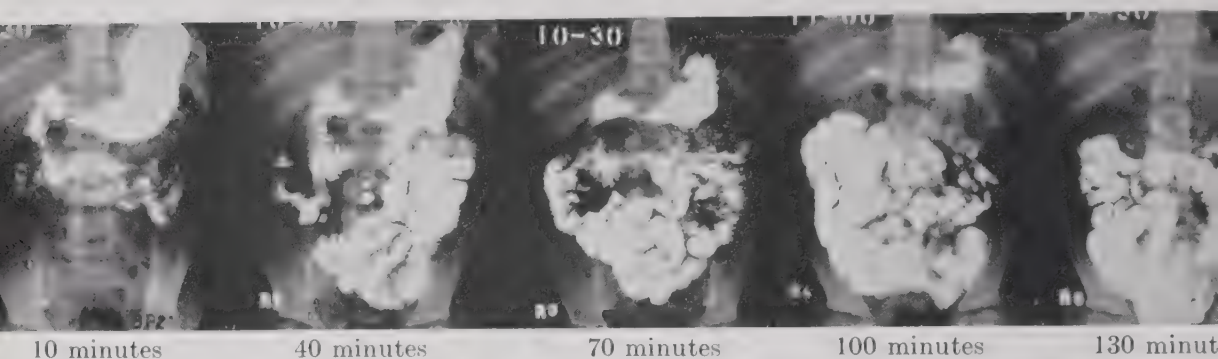


FIGURE 396. Progress of meal consisting of 2 ounces of barium sulfate and 4 ounces of water. The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

BILLY  
Age, 110 months

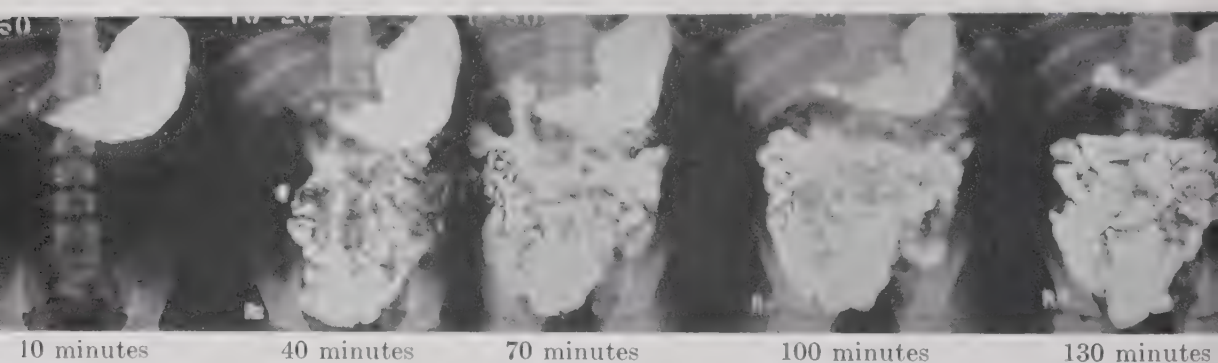


FIGURE 397. Progress of meal consisting of 2 ounces of barium sulfate, 3 ounces of water and 1 ounce of corn syrup (approximately 30 per cent glucose, 61 per cent carbohydrate). The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

BILLY  
Age, 110 months

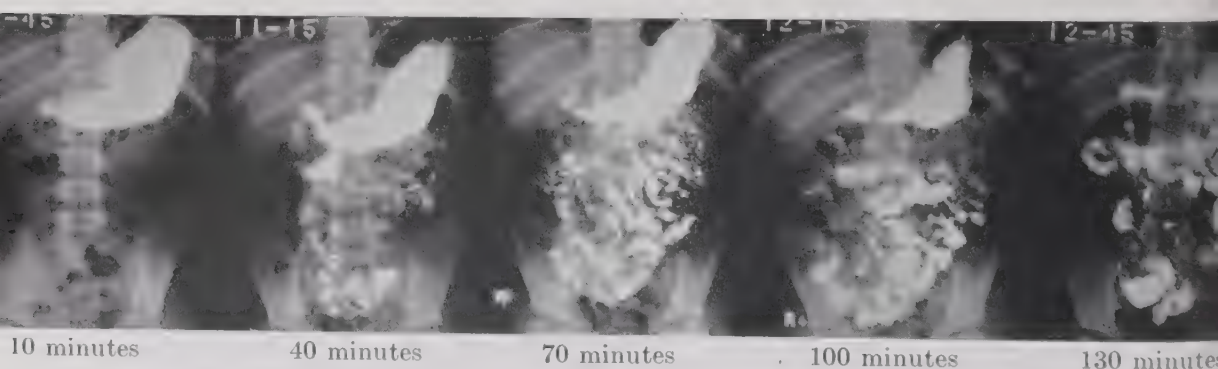
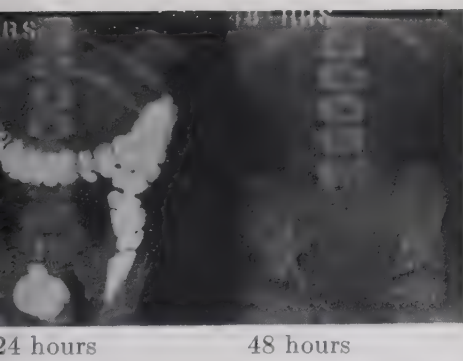
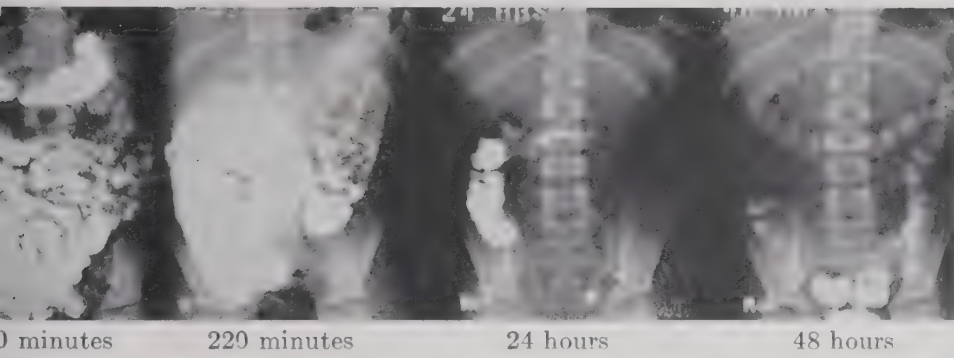
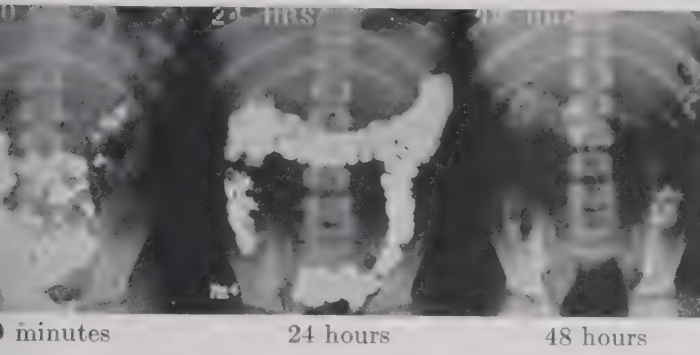


FIGURE 398. Progress of meal consisting of 2 ounces of barium sulfate and 4 ounces of standard pasteurized milk (3.5 per cent fat). The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

BILLY  
Age, 110 months

ALS THROUGH GASTROINTESTINAL TRACT





## ROENTGENOGRAMS OF PROGRESS OF BA



FIGURE 399. Progress of meal consisting of 2 ounces of barium sulfate and 4 ounces of cream (20 per cent fat). The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

BILLY  
Age, 110 months

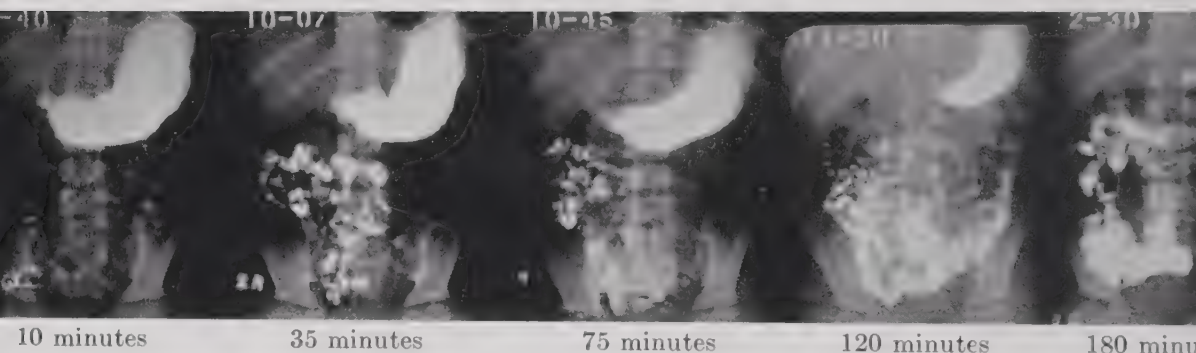


FIGURE 400. Progress of meal consisting of 40 grams of barium sulfate mixed with 100 grams of raw, ground lean meat, baked twenty to thirty minutes and ingested with 200 ml. of water. In the 290 gm. of barium, meat and water ingested (about 50 gm. of water were lost in cooking) the concentrations of fat and protein were approximately 3.5 and 7 per cent, respectively.

BILLY  
Age, 110 months

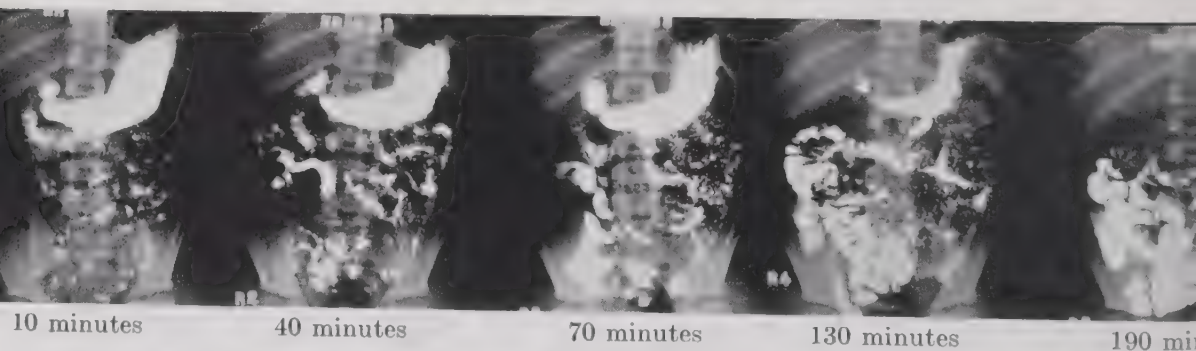
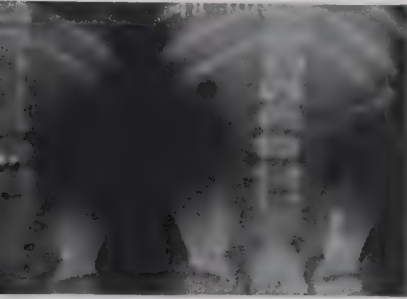


FIGURE 401. Progress of meal consisting of 2 ounces of barium sulfate, 4 ounces of standard pasteurized milk and 0.2-0.3 gm. carmine. The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

BILLY  
Age, 130 months

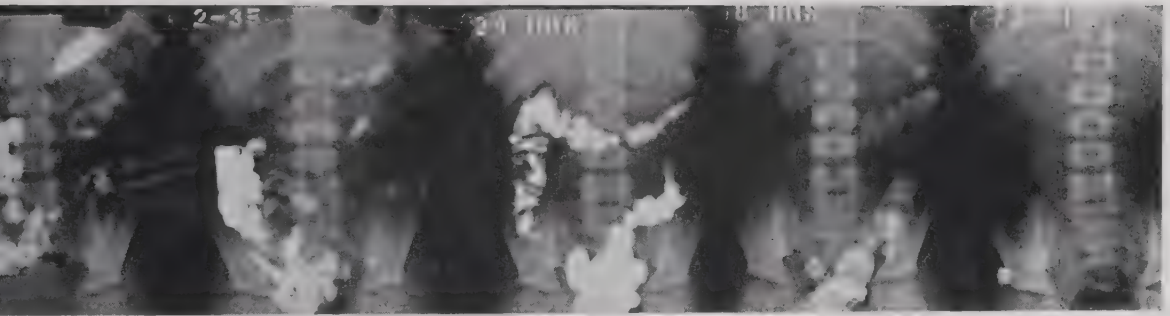


LS THROUGH GASTROINTESTINAL TRACT



4 hours

48 hours



minutes

300 minutes

24 hours

48 hours

72 hours



4 hours

48 hours

## ROENTGENOGRAMS OF PROGRESS OF BA



FIGURE 402. Progress of meal consisting of 2 ounces of barium sulfate and 4 ounces of standard pasteurized milk (3.5 per cent fat). The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

BILLY  
Age, 130 months

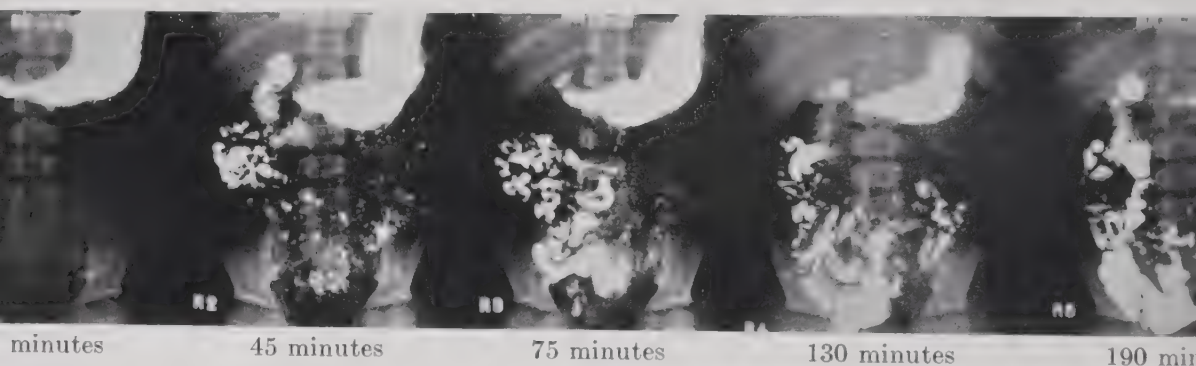


FIGURE 403. Progress of meal consisting of 2 ounces of barium sulfate and 4 ounces of evaporated milk, diluted 1:1 with water. The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

BILLY  
Age, 130 months



FIGURE 404. Progress of meal consisting of 2 ounces of barium sulfate and 4 ounces of base-exchanged milk. The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

BILLY  
Age, 130 months

S THROUGH GASTROINTESTINAL TRACT

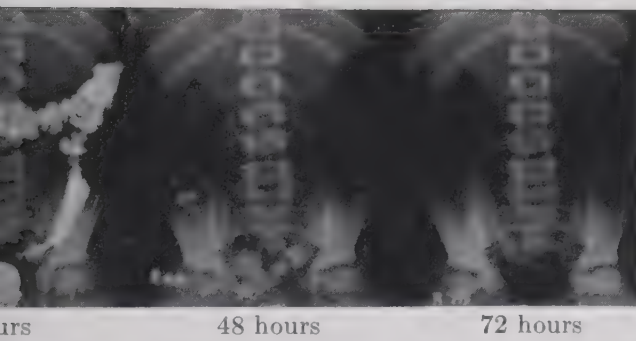
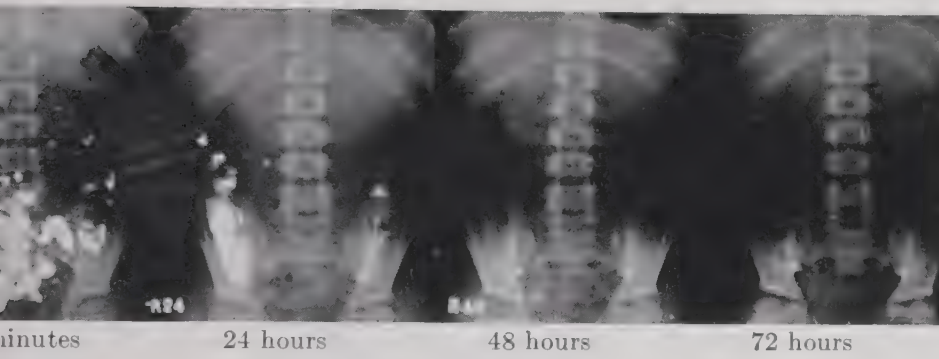
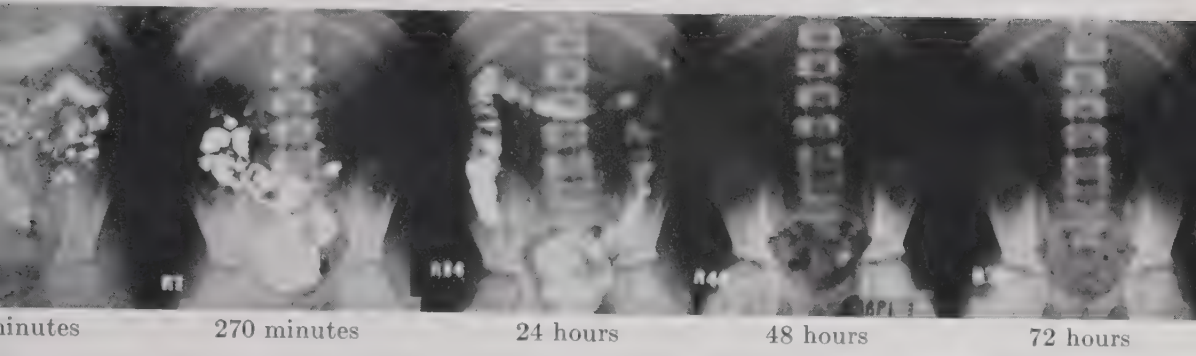




FIGURE 405. BILLY, age 130 months.



TABLE 264

Billy  
142 monthsFOOD INTAKE  
*Values in grams per day*

Food	DATE	Food	DATE	Food	DATE
	9-18 to 11-12		9-18 to 11-12		9-18 to 11-12
Apple	100	Cheese, American	20	Orange juice,	
Banana	150	Corn flakes	30	canned	100
Beef, lean	100	Egg, whole	100	Peanut butter	16
Bread, white	50	Gelatin	3	Peas, quick frozen	25
Bread,		Graham cracker	36	Potato	120
whole wheat	50	Honey	15	Salt	2
Butter	60	Lettuce	25	Sugar (average)	22
Cabbage	25	Milk, fluid,		Tomato juice	60
Carrot	50	irradiated	500	Water (average)	537

TABLE 265

Billy  
142 months

## BODY LENGTH AND WEIGHT—INTAKE AND ELIMINATION

Date	Recumbent length*	Weight*	INTAKE			AVERAGE DAILY HEAT OF COMBUSTION			FECES				
			AVERAGE DAILY						AVERAGE DAILY			Laxation rate†	Elimination time§
			Dry wt.‡	Total water†	Fat	In-take	Urine	Feces	Wet wt.	Dry wt.‡	Fat		
mo.-day	cm.	kg.	gm.	gm.	gm.	Cal.	Cal.	Cal.	gm.	gm.	gm.		hours
9-18	138	35.54	446	1838	108.6	2381	88	112	124.6	23.4	2.8	1.0	36
9-23	138	35.11	451	1752	110.6	2407	91	115	129.4	23.4	3.3	1.0	26
9-28	138	35.32	481	1743	118.2	2568	85	104	114.0	21.7	3.1	1.2	14
10-3	138	35.53	454	1785	113.4	2426	87	118	121.6	23.9	3.0	1.0	13
10-8	138	35.62	470	1780	114.2	2489	86	102	96.6	20.8	3.0	0.8	36
10-13	138	35.82	455	1702	113.0	2440	93	106	92.0	21.5	3.1	1.0	28
10-18	138	35.82	514	1689	114.3	2676	93	119	103.8	24.5	3.3	1.0	34
10-23	138	36.08	510	1680	113.1	2660	90	106	120.6	22.0	3.0	1.2	12
10-28	138	35.94	472	1679	110.5	2478	90	124	138.6	26.1	3.3	1.4	12
11-2	138	36.22	453	1664	112.8	2438	88	120	116.8	24.1	3.4	1.2	12
11-7	138	36.21	479	1657	112.2	2527	88	121	126.2	24.5	2.4	1.2	12

The age given is the initial age at start of study. Dates given are first days of five-day balance periods.

\* See Table 248 for actual values and method of smoothing.

‡ Based on vacuum-dried food and cryochem-dried feces. Corresponding values for alcohol-dried food and oven-dried feces are given in Table 597, page 1421.

† Drinking water plus water in foods.

‡ Average number of defecations per day.

§ Elapsed time between ingestion and defecation of marker used to separate feces of five-day periods



TABLE 266

Billy  
142 months

NITROGEN AND NEGATIVE MINERALS IN INTAKE, URINE, FECES  
*Values are averages per day*

Date	NITROGEN			PHOSPHORUS			CHLORINE			SULFUR		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
9-18	12.90	11.21	1.33	1474	990	482	4423	4262	76	1010	770	132
9-23	12.68	11.08	1.43	1492	927	470	4345	3960	76	959	764	141
9-28	13.26	10.70	1.33	1469	854	433	4396	4350	49	1037	756	124
10-3	13.75	11.28	1.52	1525	945	480	4332	4108	64	991	798	132
10-8	13.07	11.11	1.28	1466	935	440	4161	4248	52	1058	776	124
10-13	13.39	11.24	1.28	1529	909	432	4290	4385	31	894	792	122
10-18	13.26	11.40	1.44	1529	908	478	4491	4050	40	1032	806	140
10-23	13.66	10.79	1.41	1531	928	467	4434	4453	58	1084	741	122
10-28	13.35	10.80	1.66	1450	913	498	4295	4166	66	950	760	152
11-2	13.47	11.18	1.51	1487	904	498	4446	4059	56	970	783	146
11-7	13.21	10.72	1.42	1559	886	398	4335	4134	72	1009	747	134

TABLE 267

Billy  
142 months

POSITIVE MINERALS IN INTAKE, URINE, FECES  
*Values are averages per day*

Date	CALCIUM			MAGNESIUM			SODIUM			POTASSIUM		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
9-18	933	74	742	297	86	194	3048	2760	87	3491	3014	365
9-23	966	118	751	312	96	191	2982	2593	78	3405	2620	410
9-28	919	76	674	290	34	171	3069	2747	48	3411	2773	355
10-3	949	82	744	318	99	195	3059	2714	54	3487	2725	370
10-8	912	88	688	295	94	175	2966	2786	40	3487	2812	294
10-13	945	64	646	318	100	164	3068	2849	22	3503	2820	279
10-18	938	58	715	307	98	187	3018	2670	29	3501	2871	328
10-23	949	68	712	306	110	198	2990	2868	67	3528	3097	354
10-28	937	61	752	294	98	207	3024	2762	82	3465	2871	395
11-2	966	70	740	297	102	195	2996	2646	63	3512	3016	356
11-7	1000	57	657	309	103	164	2925	2721	73	3567	2762	347

TABLE 268

Billy  
142 monthsCOMPLEX CARBOHYDRATES IN INTAKE AND FECES  
*Values in grams per day*

Date	LIGNIN		CELLULOSE		HEMICELLULOSE		
	Intake	Feces	Intake	Feces	INTAKE		Feces
					Total	Stable	
9-18	1.26	0.93	2.88	0.91	2.87	1.65	0.66
9-23	1.26	1.35	2.88	0.83	2.87	1.65	0.74
9-28	1.26	0.96	2.88	0.68	2.87	1.65	0.58
10-3	1.26	1.20	2.88	0.71	2.87	1.65	0.70
10-8	1.26	1.16	2.88	0.61	2.87	1.65	0.60
10-13	1.26	1.36	2.88	0.43	2.87	1.65	0.75
10-18	1.26	1.62	2.88	0.51	2.87	1.65	0.94
10-23	1.26	1.10	2.88	0.89	2.87	1.65	0.65
10-28	1.26	1.62	2.88	0.90	2.87	1.65	0.63
11-2	1.26	1.26	2.88	0.79	2.87	1.65	0.64
11-7	1.26	1.44	2.88	1.02	2.87	1.65	0.68

TABLE 269

Billy  
142 monthsFAT PARTITION OF FECES  
*Values in grams per day*

Date	Unsaponi- fiable	Neutral fat	Free fatty acids	Soap
9-18	0.51	0.46	0.24	1.56
9-23	0.86	0.26	0.28	1.85
9-28	0.76	0.22	0.28	1.89
10-3	0.87	0.24	0.29	1.57
10-8	0.64	0.48	0.28	1.57
10-13	0.79	0.24	0.25	1.83
10-18	0.94	0.26	0.29	1.80
10-23	0.68	0.44	0.29	1.60
10-28	0.93	0.39	0.32	1.66
11-2	0.95	0.24	0.33	1.92
11-7	0.88	0.35	0.29	0.85

The age given is the initial age at start of study. Dates given are first days of five-day balance periods.

## NITROGEN PARTITION OF URINE

*Values in grams of nitrogen per day*

Date	Urine volume	Total nitrogen	Urea	Ammonia	Creatinine + Creatine	Creatinine	Uric acid
9-18	695	10.626	9.205	0.285	0.342	0.331	0.152
9-19	735	11.820	10.376	0.294	0.376	0.327	0.122
9-20	818	11.614	10.145	0.335	0.405	0.318	0.181
9-21	960	11.136	9.778	0.302	0.370	0.315	0.182
9-22	628	10.586	9.176	0.314	0.344	0.305	0.166
9-23	695	11.906	8.708	0.322	0.400	0.329	0.155
9-24	655	11.436	10.000	0.310	0.372	0.324	0.150
9-25	653	10.882	8.091	0.369	0.402	0.305	0.169
9-26	595	10.388	9.029	0.321	0.336	0.308	0.164
9-27	615	10.942	9.495	0.535	0.354	0.348	0.162
9-28	700	11.140	9.672	0.408	0.327	0.298	0.200
9-29	1050	11.190	9.143	0.568	0.396	0.347	0.147
9-30	950	10.747	9.082	0.422	0.348	0.319	0.133
10-1	1040	10.218	8.471	0.707	0.332	0.301	0.136
10-2	775 lost	10.182	8.553	0.427	0.372	0.324	0.134
10-4	686	11.038	9.628	0.382	0.370	0.320	0.128
10-5	623	11.467	9.994	0.386	0.363	0.306	0.156
10-6	695	11.370	9.815	0.395	0.356	0.310	0.137
10-7	1000	11.124	9.590	0.446	0.377	0.334	0.142
10-8	650	10.100	8.637	0.413	0.348	0.308	0.141
10-9	578	10.725	9.533	0.378	0.360	0.319	0.149
10-10	775	11.564	10.017	0.413	0.370	0.324	0.149
10-11	910	11.496	10.069	0.323	0.374	0.323	0.147
10-12	1115	11.508	10.142	0.316	0.397	0.326	0.158
10-13	1120	11.900	10.434	0.346	0.384	0.331	0.152
10-14	720	11.364	9.984	0.286	0.363	0.308	0.138
10-15	645	11.012	9.568	0.312	0.368	0.305	0.143
10-16	1070	10.933	9.245	0.362	0.339	0.332	0.137
10-17	1020	11.158	9.733	0.361	0.353	0.309	0.160
10-18	930	10.872	9.482	0.382	0.331	0.275	0.153
10-19	840	12.023	10.727	0.372	0.346	0.332	0.163
10-20	820	11.253	9.827	0.315	0.366	0.307	0.152
10-21	1085	11.662	10.360	0.308	0.373	0.327	0.147
10-22	810	10.692	9.112	0.304	0.336	0.336	0.159
10-23	805	10.242	8.751	0.289	0.338	0.304	0.144
10-24	960	10.722	9.485	0.271	0.362	0.324	0.165
10-25	1060	10.626	9.375	0.310	0.328	0.280	0.154
10-26	940	11.136	9.696	0.312	0.384	0.313	0.142
10-27	930	10.988	9.624	0.288	0.368	0.310	0.151
10-28	658	11.081	9.628	0.312	0.386	0.316	0.139
10-29	623	10.596	9.218	0.382	0.342	0.332	0.142
10-30	870	10.452	8.935	0.415	0.354	0.309	0.149
10-31	900	10.810	9.391	0.473	0.370	0.338	0.145
11-1	1110	10.931	9.399	0.345	0.401	0.311	0.159
11-2	1000	11.501	10.145	0.355	0.382	0.332	0.151
11-3	805	11.640	10.006	0.354	0.408	0.354	0.145
11-4	860	11.348	9.772	0.337	0.412	0.343	0.133
11-5	920	10.850	9.270	0.282	0.355	0.318	0.168
11-6	755	10.678	9.220	0.320	0.361	0.318	0.148
11-7	900	10.743	9.426	0.342	0.331	0.285	0.151
11-8	735	10.514	8.990	0.320	0.363	0.322	0.141
11-9	750	10.484	9.478	0.172	0.310	0.304	0.146
11-10	968	10.829	9.467	0.313	0.348	0.337	0.158
11-11	667	10.776	9.606	0.284	0.408	0.336	0.146

The age given is the initial age at start of study. Urine volumes are in milliliters.

TABLE 271

Billy  
142 monthsVOLUME, WEIGHT AND SULFUR PARTITION OF URINE  
*Values are averages per day*

Date	Volume	Specific gravity	Wet weight	Dry weight*	SULFUR PARTITION		
					Inorganic	Ethereal	Neutral
mo.-day	ml.		gm.	gm.	mg.	mg.	mg.
9-18†	767	1.034	793	45.9	—	—	—
9-23†	643	1.033	664	45.3	—	—	—
9-28†	903	1.025	926	44.5	659	50	47
10-3†	751	1.025	770	45.2	690	40	68
10-8†	806	1.028	829	44.8	684	42	50
10-13†	915	1.023	936	47.7	678	46	68
10-18†	897	1.023	918	48.1	705	42	59
10-23†	939	1.026	963	46.6	646	35	60
10-28†	832	1.029	856	45.4	660	44	56
11-2†	868	1.025	890	46.0	680	43	60
11-7†	804	1.025	824	45.8	—	—	—
11-7‡	—	—	—	—	626	40	49
11-8‡	—	—	—	—	663	46	—
11-9‡	—	—	—	—	634	40	114
11-10‡	—	—	—	—	636	46	66
11-11‡	—	—	—	—	711	41	66

\* Cryochem dried.

† Determined upon five-day composites and corrected for precipitate solubility.

‡ Determined upon daily urine collections and corrected for precipitate solubility.

TABLE 272

Billy  
142 months

## SALIVA CULTURE ESTIMATION OF CARIES ACTIVITY

Date	QUANTITATIVE*			QUALITATIVE†	COLOR REACTION TEST‡			
	Lacto- bacilli	Cocci	Yeast		hours after preparation			
					24	48	72	96
mo.-day	colonies per ml. of saliva							
9-22	800	0	0	+	0	0	4	4
10-23	63,000	0	0	+	0	4	4	4
10-31	2,500	0	1200	+	0	2	3	4
11-7	4,040	0	400	+	0	0	3	3
11-14	100,000	0	120	+	2	4	4	4

\* 0.2 ml. saliva to tomato agar plate.

† 1.0 ml. saliva in acid glucose broth.

‡ 0.2 ml. saliva into melted beef agar.



TABLE 273

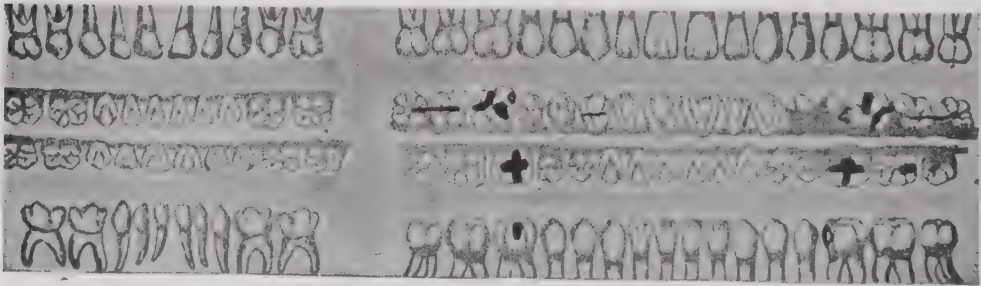
Billy

142 months

TITRABLE ACIDITY AND ORGANIC ACID IN URINE

Values in milliequivalents per day

Date	Titration acidity	pH	Total organic acid	Date	Titration acidity	pH	Total organic acid
9-18	18.2	6.61	30.6	10-16	12.2	6.72	29.4
9-19	23.4	6.03	33.6	10-17	13.6	6.79	32.4
9-20	27.9	5.90	28.2	10-18	19.7	6.38	31.4
9-21	18.6	6.40	27.8	10-19	17.9	6.48	30.0
9-22	24.6	6.14	30.2	10-20	17.0	6.68	30.2
9-23	25.8	6.11	31.4	10-21	18.7	6.41	28.6
9-24	18.7	6.43	29.5	10-22	11.6	6.63	30.4
9-25	22.2	6.20	29.8	10-23	16.2	6.53	26.9
9-26	21.0	6.15	26.4	10-24	16.8	6.50	30.1
9-27	14.2	6.99	31.3	10-25	18.6	6.39	25.0
9-28	18.9	6.58	30.9	10-26	10.2	6.67	28.2
9-29	7.6	7.37	32.2	10-27	10.5	6.74	31.2
9-30	10.4	6.90	31.8	10-28	19.4	6.30	30.0
10-1	6.6	7.80	29.4	10-29	19.0	6.23	27.2
10-2	2.9	7.40	29.5	10-30	12.2	6.44	29.2
10-3	—	—	—	10-31	10.4	6.76	31.0
10-4	15.6	6.72	29.0	11-1	8.8	6.71	32.2
10-5	18.4	6.58	26.0	11-2	19.9	6.24	29.0
10-6	15.0	6.59	33.3	11-3	13.8	6.70	32.6
10-7	11.4	6.76	29.3	11-4	21.4	6.30	28.3
10-8	7.6	7.20	32.5	11-5	9.0	6.73	28.2
10-9	18.3	5.22	29.8	11-6	14.9	6.44	29.8
10-10	16.4	6.62	32.2	11-7	13.5	6.57	31.6
10-11	25.8	6.07	30.0	11-8	18.6	6.20	31.0
10-12	19.2	6.58	28.4	11-9	18.6	6.30	31.2
10-13	21.4	6.42	29.8	11-10	13.2	6.59	29.1
10-14	16.4	6.58	32.6	11-11	25.8	5.98	28.6
10-15	19.5	6.45	27.9				



BILLY

FIGURE 406. Dental examination, age 143 months.



TABLE 274

Billy  
142 months

COPPER, ZINC MANGANESE IN INTAKE, URINE, FECES  
*Values are averages per day*

Date	COPPER*			ZINC*			MANGANESE		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake†	Urine*	Feces†
mo.-day	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
9-18	4.60	0.17	1.31	14.76	0.38	9.13	2.04	0.004	1.91
9-23	4.13	0.15	2.05	16.62	0.38	12.86	1.95	0.018	2.51
9-28	5.59	0.17	1.91	16.28	0.43	10.10	2.23	0.092	1.90
10-3	4.79	0.19	2.10	16.38	0.25	13.76	2.05	0.008	2.15
10-8	4.81	0.17	2.26	15.16	0.43	13.33	2.27	0.005	1.82
10-13	<i>4.72</i>	—	<i>1.30</i>	<i>17.18</i>	—	<i>7.56</i>	<i>2.18</i>	—	<i>1.82</i>
10-18	6.15	0.19	2.16	15.79	0.50	12.06	2.41	0.003	2.00
10-23	6.50	0.34	2.42	17.25	0.29	13.60	2.30	0.004	2.16
10-28	5.31	0.23	1.65	16.28	0.32	10.82	2.36	0.019	2.34
11-2	5.29	0.26	2.28	18.35	0.48	12.54	2.06	0.002	2.48
11-7	5.00	0.21	1.24	15.20	0.34	8.77	2.16	0.003	2.06

The age given is the initial age at start of study. Dates given are first days of five-day balance periods. Italic figures were omitted from calculations of averages given in Volume I.  
\* Determined polarographically.  
† Determined chemically.

TABLE 275

Billy  
142 months

NICKEL IN INTAKE, URINE, FECES\*  
*Values are averages per day*

Date	Intake	Urine	Feces	Date	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mo.-day	mg.	mg.	mg.
9-18	<i>1.183</i>	<i>0.005</i>	—	10-18	1.524	0.000	0.572
9-23	0.899	0.004	0.429	10-23	1.632	0.004	0.675
9-28	0.963	0.009	0.404	10-28	<i>0.980</i>	<i>0.000</i>	—
10-3	1.035	0.004	0.400	11-2	0.873	0.000	0.586
10-8	1.438	0.000	0.394	11-7	<i>1.165</i>	<i>0.000</i>	—
10-13	<i>0.527</i>	—	—				

The age given is the initial age at start of study. Dates given are first days of five-day balance periods. Italic figures were omitted from calculations of averages given in Volume I.  
\* Determined polarographically.

TABLE 275A

Billy  
142 months

## CARBON IN INTAKE, URINE, FECES

*Values in grams per day*

Date	Intake	Urine	Feces	Date	Intake	Urine	Feces
9-18	215.2	7.6	10.4	10-18	215.2	8.7	10.9
9-23	215.2	8.6	10.7	10-23	215.2	8.1	10.0
9-28	215.2	8.3	9.5	10-28	215.2	8.2	11.3
10-3	215.2	8.0	10.4				
10-8	215.2	8.0	9.3	11-2	215.2	8.4	10.8
10-13	215.2	8.7	9.5	11-7	215.2	8.5	11.3

TABLE 276

Billy  
142 monthsIRON, MANGANESE, COPPER, ALUMINUM, LEAD, TIN  
IN INTAKE, FECES\**Values in milligrams per day*

Date	IRON		MANGANESE		COPPER	
	Intake	Feces	Intake	Feces	Intake	Feces
9-18	11.24	9.75	2.04	1.96	2.79	2.24
9-23	10.59	8.45	1.87	1.72	2.37	1.85
9-28	10.11	12.86	2.27	1.76	4.39	1.66
10-3	12.84	9.66	2.03	2.31	3.80	2.10
10-8	14.35	8.19	2.27	1.50	3.67	2.16
10-13	11.80	9.16	2.16	1.66	3.65	2.26
10-18	12.49	9.31	2.19	1.57	6.26	2.50
10-23	12.79	9.36	2.22	1.64	4.29	2.68
10-28	11.36	8.44	2.18	1.73	4.75	2.99
11-2	10.57	10.20	1.80	1.78	2.53	2.59
11-7	9.34	7.82	1.81	1.41	2.91	2.18

	ALUMINUM		LEAD		TIN	
	Intake	Feces	Intake	Feces	Intake	Feces
9-18	4.55	2.88	0.58	0.23	1.33	1.00
9-23	3.95	2.62	0.56	0.26	1.52	1.22
9-28	3.00	2.21	0.52	0.29	1.79	1.24
10-3	3.53	3.14	0.52	0.23	3.32	2.00
10-8	2.58	1.70	0.62	0.22	1.54	1.67
10-13	2.13	1.66	0.45	0.16	0.92	0.75
10-18	3.66	2.43	0.67	0.20	0.77	0.83
10-23	2.86	2.34	0.62	0.20	0.72	0.53
10-28	3.17	2.59	0.52	0.24	0.70	0.64
11-2	3.40	2.55	0.66	0.21	0.75	0.49
11-7	2.29	2.62	0.52	0.30	0.76	0.46

\* Determined spectrographically by the method of Brody, James K. and Ewing, D. T. Spectrographic determination of some metallic elements in food and feces. *Indus. Engin. Chem., Anal. Ed.* 17: 627, 1945.



## BILLY

FIGURE 407. Actual size reproduction of roentgenogram of left hand.  
Chronological age 142 months.



## BILLY

FIGURE 408. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 142 months.



## BILLY

FIGURE 409. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 142 months.





## BILLY

FIGURE 410. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 142 months.



BILLY

FIGURE 411. Actual size reproduction of roentgenogram of left hip.  
Chronological age 142 months.



## BILLY

FIGURE 412. Actual size reproduction of roentgenogram of left knee.  
Chronological age 142 months.



## BILLY

FIGURE 413. Actual size reproduction of roentgenogram of left knee.  
Chronological age 142 months.





BILLY

FIGURE 414. Actual size reproduction of roentgenogram of left foot.  
Chronological age 142 months.



BILLY

FIGURE 415. Actual size reproduction of roentgenogram of left foot.  
Chronological age 142 months.

## BOBBY

Bobby's father and mother were born in Michigan and both parents finished high school. The father was a mechanic in an automobile factory; the mother worked in an office until her marriage. The first five years of their marriage were happy but when Bobby was three years old the father was placed in a hospital because of encephalitis. Two years later, when Bobby was 62 months old, he was placed in the care of the Village so that the mother might work.

### Medical History

Bobby was a full-term baby weighing 7 pounds. He was bottle-fed and walked alone at 11 months. He had mumps when three years old; whooping cough and measles when four.

Pediatric examination when Bobby was first seen at the Village was entirely negative. Schick, Mantoux and Wassermann tests were negative. A month later a tonsillectomy was advised. It was done about four weeks later and recovery was uneventful.

Bobby was 66 months old when he joined the group in the experimental cottage. October 25 a temper tantrum resulted in the loss of a fecal sample. November 18 he was isolated and kept in bed because of a skin rash and diarrhea. For three days he was kept on a liquid diet. On November 20 the pediatrician noted: "Recent G.I. upset with loose, light-colored stools. Fleeting toxic rash on face and trunk for 24 hours."

December 10 Bobby had a slight head cold with a mild cough. His chest showed a few coarse râles and he had a slight nasal discharge. The cold did not develop sufficiently to warrant medication. February 6 and 7 Bobby vomited, spontaneously and for no discernible reason. He had a severe cold March 15-19 and was isolated, in bed. March 16 he was given 5 grains of Empirin every two hours. On the following three days he was given cocillana syrup. Recovery was complete by March 22.

### Psychological

Bobby was tested first when 68 months old. On the Stanford-Binet test his M.A. was 64 months, I.Q. 94; on the Arthur Point

Scale his M.A. was 77 months, I.Q. 113; and on the Goodenough test, M.A., 60 months.

Bobby was the only one of the experimental children who seemed to be markedly in-going. He was quiet, shy, refused to respond at first, gave a nervous smile at first and refused to attempt several of the tests which were asked of him.

Bobby was first seen near the end of the first examining day. He did so poorly on the Knox Cubes, the first of the Arthur Point Scale test, that examiner started the Stanford-Binet. On this scale he either failed or refused several items in such a way that examiner could not judge whether he really failed them or whether he was not exerting proper effort. It was felt at this time that in his shyness there was also a touch of stubbornness. For this reason he was approached more slowly the next morning and given a great deal of encouragement and urging.

Bobby is left-handed. Test results indicate that Bobby is a child of normal average intelligence of the middle range and that he works somewhat better with his hands than he does with abstract and verbal material. This type of discrepancy in test results is frequently seen in children who are in-going.

Bobby was reexamined three years later by the same psychologist. His chronological age was 102 months and on the Revised Stanford-Binet Scale, Form L his M.A. was 102 months, I.Q. 100.

Bobby was seen at this time in a clinic room of the Administration Building of the Village. He came up to the building rather slowly and was shy in meeting the examiner. He is an attractive little boy but appears to be smaller than average for his age and is thin. He was not as talkative as the other children, either in the examination room or in the cottage. After lunch he played for a little while with Frank Campbell and it was observed that Bobby did not hold his own very well when there was any competition.

Bobby cooperated fairly well in the examination; he did not show the marked timidity that he had shown at the beginning of the examination three years ago. He is able to concentrate his attention fairly well for a child of his age and his speed of reaction is average. Bobby showed middle range average ability in dealing with abstract verbal problems as measured by the Revised Stanford-Binet test. His basal age was year 6 and successes ranged through year 11. The only failure at year 7 was with the comprehension questions. In contrast to this he was successful with the comprehension questions at year 8. He failed the verbal absurdities at year 8 and above. His vocabulary is good for his age and he does well in generalizing.

This rating places Bobby in the same grouping as did his results on the Stanford-Binet test three years ago and so the fact of his



average intelligence is verified. On the previous test, however, his scatter was unusually narrow, whereas he showed more variation at this time.

### **Endocrinological**

Bobby was 72 months old when classified by the endocrinologist, from the medical history, growth records, basal metabolism, physical examination and roentgenograms of hip, shoulder, knee, elbow, foot and hand.

Gain of 1.5 inches since June, a period of about nine months. Normal increment for this time and age is 1.7 inches. None of the deciduous teeth has exfoliated. No structural endocrine abnormality.

#### *Roentgenographic Study for Osseous Development*

Wrist: Six carpal bones normally present. Epiphyses of the phalanges and metacarpals are present and normally developed. Distal epiphysis of the radius present and normally developed.

Elbow: Caput humerus present and normally developed. Proximal epiphysis of the radius, which normally appears at five, is present and normally developed.

Knee: Distal epiphysis of the femur is present and normally developed. Proximal epiphysis of the tibia is present. Proximal epiphysis of the fibula is absent. This should appear at four. The patella should be present at five.

Diagnosis: Delay of one to two years in osseous development.

Classification: Probable endocrine normal.

## RECUMBENT LENGTH AND WEIGHT

Age	RECUMBENT LENGTH		Weight	AGE	RECUMBENT LENGTH		Weight
	Total	Stem			Total	Stem	
mo.-days	cm.	cm.	kg.	mo.-days	cm.	cm.	kg.
65-2	113.7	—	19.05	71-11	117.5	66.7	—
65-23	—	—	18.21	71-16	—	—	19.89
65-27	—	—	18.20	71-18	116.8	66.0	—
66-0	—	—	18.23	71-21	—	—	19.82
66-5	—	—	18.14	71-23	117.0	65.7	—
66-9	114.0	64.8	—	71-26	—	—	19.80
66-12	—	—	18.26	71-29	117.5	66.4	—
66-17	—	—	18.52	72-0	—	—	19.80
66-20	—	—	18.63	72-5	117.5	66.5	19.70
66-26	114.6	66.0	—	72-11	117.1	66.0	—
66-27	—	—	18.40	72-12	—	—	19.90
67-1	—	—	18.60	72-15	—	—	19.80
67-11	114.9	65.4	—	72-16	117.5	66.4	—
67-12	—	—	18.23	72-20	—	—	19.70
67-17	—	—	18.15	72-22	117.8	67.0	—
67-20	—	—	18.30	72-26	117.8	66.7	19.65
67-26	115.3	66.0	—	73-27	117.7	65.1	19.86
67-27	—	—	18.50	74-29	118.8	65.6	20.16
68-2	—	—	18.60	76-3	119.7	67.2	20.34
68-5	114.9	65.7	—	77-1	119.8	66.4	20.66
68-7	—	—	18.75	78-1	120.4	67.3	20.20
68-10	—	—	18.80	79-4	120.7	67.3	21.11
68-15	—	—	18.72	80-2	121.7	67.5	21.22
68-18	115.9	66.2	—	83-14	123.7	68.8	22.36
68-20	—	—	18.90	86-22	126.3	70.4	22.91
68-27	—	—	19.09	101-12	130.8	73.0	26.42
68-29	—	—	19.13	113-1	—	—	29.62
69-2	115.9	66.4	—	113-6	—	—	29.07
69-6	—	—	19.69	113-12	—	—	29.14
69-12	—	—	19.50	113-16	140.9	76.2	28.96
69-14	—	—	19.40	113-19	140.7	76.5	—
69-17	115.9	66.0	—	113-21	140.4	76.4	29.02
69-20	—	—	19.65	113-23	140.6	76.2	—
69-27	—	—	19.40	113-25	141.0	77.3	—
69-29	116.5	66.0	—	113-27	—	—	28.93
70-2	—	—	19.45	114-2	—	—	29.12
70-5	—	—	19.69	114-7	—	—	29.16
70-11	—	—	19.80	114-12	—	—	29.16
70-15	—	—	19.65	114-18	—	—	29.18
70-19	—	—	19.70	114-21	141.4	77.0	28.11
70-21	116.8	66.0	—	114-23	141.1	77.6	—
70-25	—	—	19.80	114-24	141.0	77.3	—
71-0	—	—	19.95	114-26	141.0	77.2	—
71-5	—	—	19.75	114-27	140.6	77.3	—
71-6	117.5	66.7	—	114-28	—	—	28.91
71-10	—	—	19.65	150-0	166.3	89.3	51.14

Actual values are averages of independent measurements by two workers. In calculating the smooth values given with the balance data the actual values given above were smoothed by three-point averaging and the resulting figures entered for their respective balance periods. Values for balance periods intervening between measurements were obtained by interpolation.

TABLE 278

Bobby

## ANTHROPOMETRIC MEASUREMENTS

*Values in centimeters*

Age*	BREADTH			LENGTH		WIDTH	
	Biacro- mial	Intertro- chanteric	Inter- cristal	Tibia	Head	Chest	Head
67	20.1	19.0	18.0	22.7	18.0	18.7	14.7
67	20.9	18.4	17.0	23.0	18.0	18.0	14.7
69	20.7	18.7	17.6	23.5	18.0	18.5	14.8
70	20.5	18.9	17.5	23.5	18.0	18.6	14.7
71	20.9	18.9	17.4	23.6	18.0	18.0	14.8
72	20.7	18.6	17.4	24.3	18.1	18.7	14.8
73	21.4	19.1	17.3	23.6	18.1	18.4	14.8
74	21.0	19.0	17.4	23.9	18.1	18.2	14.9
75	21.7	18.8	17.4	24.1	18.3	18.3	14.8
76	22.7	19.0	17.6	24.3	18.2	18.1	14.9
77	23.2	19.0	17.7	25.0	18.3	19.0	14.8
78	22.4	18.5	17.2	24.3	18.2	19.0	14.8
79	23.1	19.0	17.7	24.8	17.9	18.5	14.9
80	23.0	19.4	17.5	25.3	18.0	18.4	14.9
83	23.0	19.4	18.5	25.5	18.0	19.2	14.9
87	23.0	19.9	18.4	26.4	18.4	19.1	15.0
101	22.8	—	19.0	27.5	18.5	20.9	15.2
113	25.7	—	19.8	30.0	18.6	21.4	15.4
114	25.5	—	20.0	30.6	18.7	21.0	15.2
115	25.3	—	20.0	30.6	18.5	21.5	15.8
150	36.3	29.7	25.5	44.7	18.7	24.7	15.5

Age*	DEPTH	CIRCUMFERENCES				
	Chest	Head	Chest	Thigh	Abdomen	Upper arm
67	12.8	51.4	52	29	50	14.6
67	12.8	52.0	52	28	50	13.8
69	12.8	52.0	53	30	50	14.4
70	12.5	52.2	53	30	50	14.6
71	12.9	52.0	53	30	49	14.8
72	13.0	51.8	54	31	52	15.0
73	12.5	52.3	51	29	49	14.9
74	13.0	52.5	55	29	49	14.5
75	13.0	53.0	54	30	50	14.4
76	12.5	52.0	55	29	50	14.5
77	12.5	52.7	55	30	50	15.0
78	12.6	52.5	53	30	52	14.3
79	12.5	53.0	55	31	50	14.4
80	13.0	52.5	56	30	51	14.4
83	13.0	52.4	57	33	53	15.0
87	12.5	53.0	56	31	53	17.0
101	14.7	53.0	61	34	57	15.4
113	13.5	53.5	60	36	53	17.0
114	13.8	53.5	61	34	53	16.2
115	14.2	53.5	62	34	55	16.0
150	15.9	53.9	73	47	77	23.3

\* Months.

TABLE 279

Bobby

## BLOOD DETERMINATIONS

Age	Date	Red cells	Hemo- globin	WHITE BLOOD CELLS					
				Total	Poly- morpho- nuclears	Lym- pho- cytes	Mono- cytes	Eosino- philes	
months	mo.-day	millions	gm./100 cc.	per c. mm.	per cent	per cent	per cent	per cent	
65	9-19	4.27	13†	9950	43	43	8	9	
71	3-24	4.17	12†	12250	55	31	10	3	
73	5-11	4.10	12†	9000	38	38	10	14	
*73	5-20	4.39	12†	—	—	—	—	—	
*113	9-13	4.92	13‡	8400§	56	36	—	8	
		RED BLOOD CELL MEASUREMENTS							
		Hematocrit		Volume	Weight	Diameter	Thickness		
		per cent		c.μ	μg.	μ	μ		
73	5-20	42		96	108	7.2	2.4		
113	9-13	43		87	—	7.4	2.0		
		MINERALS (mg. per 100 ml.)							
		SERUM					ERYTHROCYTES		
		Cal- cium	Phos- phorus	So- dium	Potas- sium	Chlor- ine	So- dium	Potas- sium	Chlor- ine
65	9-16	10.8	3.92	335	16.7	382	37	398	161
73	5-20	11.4	7.94	319	17.1	351	44	478	182
113	9-13	9.8	5.21	325	15.9	356	37	427	196
		PLASMA NITROGEN AND LIPID (mg. per 100 ml.)							
		Nitro- gen	Total lipid	Phos- pholipid	Neutral fat	CHOLESTEROL			
						Total	Free	Esters	
73	5-20	1159	358	118	114	82	17	109	
		ERYTHROCYTE NITROGEN AND LIPID (mg. per 100 gm.)							
73	5-20	5015	421	247	41	110	77	55	
73	5-20	Red blood cells total solids: 33.6 per cent by weight. Specific gravity: whole blood, 1.05; plasma, 1.03; red cells, 1.08.							

\* Venous blood.

† Haden-Hauser hemoglobinometer.

‡ Evelyn photoelectric colorimeter.

§ Oxalate added.

## BASAL METABOLISM MEASUREMENTS

Age	Date	Sur- face area*	Respi- ration	Pulse rate	Body temper- ature	Blood pres- sure	Basal metab- olism
months	mo.-day	sq.m.	per min.	per min.	°F	S/D†	Cal./24 hr.
66	10-15	0.763	26	—	—	—	979
66	10-26	0.765	35	—	—	—	936
67	11-12	0.770	23	88	99.2	76/58	917
67	11-27	0.769	35	88	98.0	84/64	977
68	12-12	0.776	25	86	98.2	88/63	996
68	12-21	0.777	23	87	98.4	88/60	1003
69	1-3	0.786	23	100	98.2	88/60	970
69	1-17	0.790	26	90	98.6	94/66	970
70	2-1	0.795	25	90	99.1	91/60	917
70	2-13	0.798	24	92	98.8	88/62	1018
71	3-6	0.804	23	88	99.2	93/62	1020
71	3-21	0.809	26	84	98.2	94/72	994
71	3-26	0.807	25	88	98.2	84/66	910
72	4-2	0.808	31	88	98.6	96/66	941
72	4-7	0.808	26	100	99.1	96/64	1046
72	4-13	0.810	27	98	98.6	94/58	1018
72	4-19	0.808	30	88	98.7	92/64	1032
72	4-25	0.809	23	90	99.1	90/66	989
73	4-30	0.810	33	100	99.2	92/60	924
73	5-6	0.810	26	87	98.0	92/66	1013
73	5-10	0.808	26	88	98.4	92/64	972
113	9-19	1.09	34	80	98.4	94/62	1412
113	9-20	1.09	34	70	98.8	96/58	1536
114	11-2	1.09	22	70	98.8	88/46	1506
115	11-3	1.09	26	76	98.6	88/44	1394

\* DuBois formula.

† Systolic/Diastolic.

TABLE 281

## SKELETAL MATURATION

*Values in months*

Chrono- logical age	HAND				FOOT	ELBOW	KNEE	HIP	SHOULDER	AVERAGE
	B.B.G.*	Flory†	Kelly‡	Todd§	Todd§	Todd§	Todd§	Todd§	Todd§	Todd§
65	74	51	75	62	68	68	63	63	68	66
71	78	51	77	67	74	73	67	66	69	69
73	83	60	84	67	75	74	68	66	69	70
87	98	76	92	88	89	87	93	93	93	90
113	126	99	131	121	127	123	123	123	121	123
150	202	139	200	171	—	—	—	—	—	—

\* Baldwin, B. T., Busby, L. M., Garside, H. V. Anatomic growth of children. University of Iowa Studies in Child Welfare, vol. 4, no. 1, 1928.

† Flory, C. D. Osseous development in the hand as an index of skeletal development. Monographs of the Society for Research in Child Development, vol. 1, no. 3, 1936.

‡ Kelly, H. J. Anatomic age and its relation to stature. University of Iowa Studies in Child Welfare, vol. 12, no. 5, 1937.

§ Determined by T. Wingate Todd, C. C. Francis and Idell Pyle, Western Reserve University, Cleveland.



TABLE 282

Bobby

## HEIGHT AND WEIGHT RECORD\*

Age	Height	Weight	Age	Height	Weight	Age	Height	Weight
months	inches	pounds	months	inches	pounds	months	inches	pounds
62	44	40	84	48 $\frac{1}{2}$	51 $\frac{3}{4}$	114	53 $\frac{1}{4}$	63 $\frac{1}{4}$
67	45 $\frac{1}{2}$	42 $\frac{3}{4}$	91	49 $\frac{3}{4}$	53 $\frac{1}{4}$	115	54 $\frac{3}{4}$	67
68	45 $\frac{1}{2}$	42 $\frac{3}{4}$	97	50 $\frac{3}{4}$	57 $\frac{1}{4}$	116	54 $\frac{3}{4}$	67 $\frac{3}{4}$
70	45 $\frac{1}{2}$	44 $\frac{3}{4}$	100	51	58	123	56 $\frac{1}{2}$	72 $\frac{3}{4}$
75	46 $\frac{3}{4}$	44 $\frac{3}{4}$	105	52 $\frac{3}{4}$	63 $\frac{1}{2}$	124	57	75
			110	53 $\frac{1}{4}$	65			

\* Clinical. See also table of recumbent lengths and weights.

TABLE 283

Bobby

## MEASUREMENTS OF THE BONES OF THE WRIST

AGE, months	65	71	73	87	113	150
CARPALS						
AREA, sq. mm.						
Hamate	77	78	82	100	147	251
Capitate	118	116	128	154	210	319
Lesser Multangular	1	6	8	30	69	126
Greater Multangular	12	16	20	42	84	218
Navicular	6	13	16	46	104	247
Lunate	29	33	36	55	96	198
Triangular	35	39	41	55	93	168
Pisiform						104
GREATEST DIAMETER, mm.						
Hamate	12	12	13	14	18	25
Capitate	15	15	16	18	21	27
Lesser Multangular	1	3	4	6	10	13
Greater Multangular	5	5	6	8	12	20
Navicular	3	5	5	9	15	24
Lunate	8	8	8	10	14	21
Triangular	8	8	9	10	13	17
Pisiform						12
Epiphyses						
1st Metacarpal	6	6	6	8	11	15
2nd Metacarpal	9	9	9	9	12	14
3rd Metacarpal	7	8	8	8	11	14
4th Metacarpal	6	7	7	7	9	12
ULNA						
DIAMETER, mm.						
Distal epiphysis				3	12	19
Distal metaphysis	11	12	12	13	15	18
RADIUS						
DIAMETER, mm.						
Distal epiphysis	14	16	16	19	23	33
WRIST AREA,* sq. mm.	1035	1106	1111	1252	1492	2000

\* Measured with the planimeter using Flory's landmarks (Monographs of the Society for Research in Child Development, Vol. I, No. 3, 1936).



BOBBY

FIGURE 416. Actual size reproduction of roentgenogram of left hand.  
Chronological age 65 months.



BOBBY

FIGURE 417. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 65 months.



BOBBY

FIGURE 418. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 65 months.





## BOBBY

FIGURE 419. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 65 months.



BOBBY

FIGURE 420. Actual size reproduction of roentgenogram of left hip.  
Chronological age 65 months.



BOBBY

FIGURE 421. Actual size reproduction of roentgenogram of left knee.  
Chronological age 65 months.



BOBBY

FIGURE 422. Actual size reproduction of roentgenogram of left knee.  
Chronological age 65 months.



BOBBY

FIGURE 423. Actual size reproduction of roentgenogram of left foot.  
Chronological age 65 months.





BOBBY

FIGURE 424. Actual size reproduction of roentgenogram of left foot.  
Chronological age 65 months.

TABLE 284

Bobby  
66 monthsFOOD INTAKE  
*Values in grams per day*

Food	DATE							
	9-30 to 11-4	11-4 to 12-4	12-4 to 1-13	1-13 to 2-7	2-7 to 3-3	3-3 to 3-18	3-18 to 3-23*	3-23 to 5-12‡
Apple	100	100	100	100	100	100	100	100
Ascorbic acid	—	—	.02	.02	.02	—	—	—
Banana	100	200	200	200	200	100	100	100
Beef, lean	100	100	100	100	100	100	100	100
Bread, white	20	10	60	60	60	70	70	70
Bread, whole wheat	30	30	30	30	30	30	30	30
Butter	20	20	30	30	30	30	33	33
Cabbage	25	25	25	25	25	25	25	25
Carrot	25	25	25	25	25	25	25	25
Cheese, American	15	15	15	15	15	15	15	15
Corn flakes	15	5	5	5	5	15	15	15
Egg, whole	50	50	50	50	50	50	50	50
Graham cracker	18	18	18	18	18	18	18	18
Lettuce	20	20	20	20	20	20	20	20
Milk, evaporated	—	—	—	400	400†	—	—	—
Milk, fluid	400	400	400	—	—	400†	400†	400†
Orange concentrate	50	50	50	50	50	—	—	—
Orange juice, fresh	—	—	—	—	—	50	50	50
Peanut butter	16	16	16	16	16	16	16	16
Potato	40	40	70	70	70	70	70	70
Salt	2	2	2	2	2	2	2	2
Shredded wheat	15	5	5	5	5	15	15	15
Spinach	—	—	—	—	—	100	—	—
Sugar (average)	9	6	8	8	8	8	8	7
Tomato juice	60	60	60	60	60	60	60	60
Water (average)	394	359	455	513	497	384	475	489

\* Oxalic acid, 0.7 gm., and calcium (as acetate) 0.058 gm., additional.

† Irradiated. Evaporated milk diluted 1:1.

‡ Adrenal cortex extract, 3 cc. hypodermically, April 7, 9, 12, 14, 17, 19, 22, 24.

TABLE 285

Bobby  
67 months

## PEDOMETER MEASUREMENTS

Date	Miles	Date	Miles	Date	Miles	Date	Miles	Date	Miles
11-16	1½	12-21	2½	1-19	3½	2-22	4	3-28	5
11-17	2¼	12-22	2¼	1-25	2½	2-23	4½	3-29	4½
11-24	1¾	12-28	1½	1-26	2½	2-29	3	4-4	2½
11-30	1½	12-29	1½	2-1	4	3-1	3½	4-5	2½
12-1	2¼	1-4	2½	2-2	2½	3-7	3½	4-11	3½
12-7	1½	1-5	½	2-8	3½	3-8	1½	4-12	4
12-8	1½	1-11	3	2-9	2¼	3-14	3¼	4-18	4½
12-14	2¼	1-12	2½	2-15	2½	3-21	2½	4-19	½
12-15	2½	1-18	2½	2-16	2½	3-22	3½		

New Haven pedometers were set at 27 inches and worn hooked to belt during hours awake.

TABLE 286

Bobby  
66 months

## BODY LENGTH AND WEIGHT—INTAKE AND ELIMINATION

Date	Recumbent length*	Weight*	INTAKE			AVERAGE DAILY HEAT OF COMBUSTION			FECES				
			AVERAGE DAILY						AVERAGE DAILY			Laxation rate†	Elimination time‡
			Dry wt.‡	Total water†	Fat	In-take	Urine	Feces	Wet wt.	Dry wt.‡	Fat		
mo.-day	cm.	kg.	gm.	gm.	gm.	Cal.	Cal.	Cal.	gm.	gm.	gm.		hours
9-30	114	18.21	321	1068	57.5	1646	49	189	233.0	39.0	3.6	4.0	15
10-5	114	18.21	314	1196	57.5	1619	60	86	170.4	25.0	1.9	3.0	11
10-10	114	18.21	316	1313	57.5	1627	59	81	154.8	21.0	2.0	2.4	13
10-15	114	18.19	320	1271	57.5	1642	79	92	169.8	21.0	2.1	3.4	10
###													
10-25	114	18.31	318	1197	57.5	1633	61	61	89.8	11.0	1.0	1.8	23
10-30	114	18.47	327	1203	57.5	1670	63	84	86.8	19.0	2.2	1.6	25
11-4	114	18.52	318	1263	58.9	1648	58	67	97.2	14.0	1.6	1.6	25
11-9	114	18.54	322	1204	58.9	1666	57	69	111.2	16.0	1.7	2.2	10
###													
11-24	115	18.33	313	1237	58.9	1630	72	102	152.0	24.0	2.4	3.6	27
11-29	115	18.23	310	1285	58.9	1618	62	77	157.4	18.0	1.6	3.6	10
12-4	115	18.32	359	1365	73.3	1880	64	101	198.2	23.0	2.5	3.8	6
12-0	115	18.47	359	1350	73.3	1882	65	86	160.4	19.0	2.1	3.4	10
12-14	115	18.62	361	1377	73.3	1887	65	89	156.0	17.0	1.9	2.4	26
12-19	115	18.72	361	1378	73.3	1887	63	90	160.6	21.0	2.4	3.0	25
12-24	116	18.76	370	1378	73.3	1924	—	76	136.4	16.0	1.8	2.2	24
12-29	116	18.81	364	1363	73.3	1901	69	86	173.6	18.0	2.0	2.4	25
1-3	116	18.90	361	1347	73.3	1889	58	69	148.8	18.0	1.9	1.8	11
1-8	116	19.04	366	1507	73.3	1910	71	102	150.8	26.0	2.8	2.8	7
1-13	116	19.30	382	1276	76.6	1927	72	124	150.6	27.0	2.8	2.6	11
1-18	116	19.44	381	1221	76.6	1923	70	99	139.8	20.0	2.1	1.8	26
1-23	116	19.53	377	1285	76.6	1905	76	107	147.0	21.0	2.2	2.2	10
1-28	116	19.52	379	1193	76.6	1913	63	105	143.2	23.0	2.4	2.2	11
###													
2-7	116	19.50	373	1215	76.6	1913	71	128	163.0	30.0	3.8	1.8	10
2-12	116	19.51	383	1180	76.6	1934	63	108	173.0	24.0	2.6	3.0	6
2-17	116	19.65	376	1148	76.6	1908	76	86	166.8	20.0	2.4	3.0	11
2-22	117	19.71	380	1240	76.6	1921	62	111	159.4	27.0	2.9	2.8	26
2-27	117	19.72	377	1262	76.6	1910	83	97	174.0	24.0	2.4	2.6	11
3-3	117	19.72	364	1340	77.0	1839	57	100	142.8	26.0	2.7	2.6	6
3-8	117	19.82	367	1263	77.0	1850	73	131	150.4	29.0	2.9	2.8	12
3-13	117	19.83	368	1415	77.0	1853	83	81	111.4	15.0	1.6	2.6	8
3-18	117	19.78	351	1348	77.5	1846	72	79	135.2	22.0	2.6	2.0	29
3-23	117	19.76	343	1300	77.5	1848	64	94	128.8	20.0	2.5	2.4	7
3-28	117	19.79	342	1339	77.5	1842	70	88	118.4	21.0	2.5	2.0	10
4-2	117	19.84	341	1254	77.5	1840	67	82	97.6	20.0	2.2	2.0	25
4-7	117	19.81	339	1268	77.5	1832	63	74	135.4	15.0	1.6	2.8	11
4-12	117	19.77	346	1251	77.5	1857	62	114	117.8	26.0	2.9	2.4	8
4-17	117	19.80	343	1297	77.5	1847	65	97	108.6	22.0	2.6	2.0	26
4-22	117	19.80	342	1281	77.5	1842	67	110	111.6	24.0	2.4	2.2	12
4-27	118	19.80	341	1501	77.5	1839	65	87	117.0	14.0	1.6	2.8	9
5-2	118	19.72	346	1431	77.5	1860	66	90	101.4	22.0	2.8	1.8	30
5-7	118	19.67	342	1781	77.5	1845	63	77	91.8	19.0	2.6	2.0	10

The age given is the initial age at start of study. Dates given are first days of five-day balance periods. Italic figures were omitted from calculations of averages given in Volume I.

\* See Table 277 for actual values and method of smoothing.

† Based on alcohol-dried food and oven-dried feces.

‡ Drinking water plus water in foods.

§ Average number of defecations per day.

¶ Elapsed time between ingestion and defecation of marker used to separate feces of five-day periods.

# See case history, page 878, for explanation for missing periods.

TABLE 287

Bobby  
66 monthsNITROGEN AND NEGATIVE MINERALS IN INTAKE, URINE, FECES  
*Values are averages per day*

Date	NITROGEN			PHOSPHORUS			CHLORINE			SULFUR		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
9-30	9.45	6.39	1.47	996	496	612	3031	2554	113	612	400	199
10-5	9.45	7.90	1.50	996	646	319	3031	2989	26	612	472	83
10-10	9.45	7.54	1.07	996	640	355	3031	2514	16	612	503	80
10-15	9.45	7.14	1.18	996	586	356	3031	2628	7	612	483	93
***												
10-25	9.45	7.97	0.85	996	446	280	3031	2914	9	612	535	66
10-30	9.45	7.97	1.04	996	617	472	3031	2658	17	612	522	99
11-4	9.26	7.64	0.90	951	669	320	2924	2566	55	596	505	73
11-9	9.26	7.96	0.99	951	516	298	2924	2892	59	596	527	79
***												
11-24	9.26	7.85	1.28	951	554	456	2924	2634	139	596	471	108
11-29	9.26	7.81	1.18	951	559	361	2924	2760	84	596	474	88
12-4	10.06	8.04	1.43	1049	530	392	3417	3060	112	668	514	123
12-9	10.06	8.42	1.44	1049	669	291	3417	3120	83	668	520	84
12-14	10.06	8.32	1.24	1049	552	329	3417	2880	150	668	532	100
12-19	10.06	8.75	1.34	1049	586	362	3417	3246	50	668	555	101
12-24	10.06	8.39	1.17	1049	611	315	3417	3000	39	668	541	78
12-29	10.06	8.68	1.22	1049	546	350	3417	3000	62	668	568	92
1-3	10.06	8.23	1.12	1049	556	249	3417	2940	32	668	513	72
1-8	10.06	8.79	1.21	1049	653	390	3417	2933	79	668	557	102
1-13	10.12	7.82	1.23	1122	628	411	3409	3091	84	701	511	117
1-18	10.12	9.00	1.15	1122	640	370	3409	3264	63	701	556	102
1-23	10.12	8.31	1.37	1122	648	323	3409	3048	49	701	547	104
1-28	10.12	8.23	1.05	1122	718	311	3409	3174	53	701	556	103
***												
2-7	10.12	8.43	1.41	1122	695	470	3409	2934	109	701	553	134
2-12	10.12	7.84	1.36	1122	692	337	3409	2916	119	701	513	106
2-17	10.12	8.19	1.24	1122	684	279	3409	3042	100	701	542	86
2-22	10.12	7.92	1.20	1122	710	345	3409	3012	62	701	531	109
2-27	10.12	8.38	1.21	1122	699	295	3409	2916	54	701	549	99
3-3	10.68	8.26	1.14	1175	728	363	3955	3606	87	726	559	110
3-8	10.68	8.76	1.30	1175	733	415	3955	3744	74	726	604	149
3-13	10.68	9.32	1.18	1175	724	284	3955	4014	49	726	642	99
3-18	10.39	8.86	1.11	1088	766	330	3418	2814	46	698	588	104
3-23	10.39	8.20	1.06	1088	690	326	3418	3246	49	698	526	99
3-28	10.39	8.19	1.00	1088	652	315	3418	3258	63	698	550	90
4-2	10.39	8.32	1.10	1088	662	307	3418	3522	50	698	559	79
4-7	10.39	8.37	1.13	1088	626	271	3418	3120	46	698	513	76
4-12	10.39	8.88	1.22	1088	722	422	3418	3282	37	698	562	119
4-17	10.39	8.73	1.17	1088	742	369	3418	3114	43	698	550	105
4-22	10.39	8.62	1.11	1088	730	389	3418	3288	78	698	556	122
4-27	10.39	8.63	1.15	1088	664	311	3418	3216	60	698	557	96
5-2	10.39	8.68	1.09	1088	702	360	3418	3246	56	698	566	96
5-7	10.39	8.19	1.05	1088	714	287	3418	2976	40	698	427	79

\* See footnotes to Table 286.



TABLE 288

Bobby  
66 months

POSITIVE MINERALS IN INTAKE, URINE, FECES  
*Values are averages per day*

Date	CALCIUM			MAGNESIUM			SODIUM			POTASSIUM		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
9-30	722	98	618	248	35	184	1876	1643	154	2252	1231	621
10-5	722	120	492	248	60	128	1876	1839	64	2252	1570	486
10-10	722	104	587	248	60	157	1876	1617	45	2252	1355	349
10-15	722	91	597	248	60	180	1876	1672	58	2252	1440	703
###												
10-25	722	88	517	248	69	137	1876	1924	20	2252	1664	277
10-30	722	83	619	248	59	151	1876	1663	00	2252	1895	257
11-4	724	82	545	262	55	170	1769	1566	29	2628	2052	261
11-9	724	86	538	262	62	166	1769	1758	23	2628	1895	426
+												
11-24	724	73	672	262	52	203	1769	1720	72	2628	2100	711
11-29	724	75	606	262	63	184	1769	1614	57	2628	1500	677
12-4	757	84	614	289	70	206	2063	1920	100	2763	1825	693
12-9	757	91	525	289	70	176	2063	1854	56	2763	1895	537
12-14	757	87	614	289	20	200	2063	1826	86	2763	2050	594
12-19	757	83	664	289	89	195	2063	1978	63	2763	2050	669
12-24	757	68	592	289	55	179	2063	1906	46	2763	2030	521
12-29	757	70	629	289	76	211	2063	1883	95	2763	1930	617
1-3	757	57	563	289	91	170	2063	1822	62	2763	1960	585
1-8	757	71	609	289	77	185	2063	1860	67	2763	1921	573
1-13	804	70	721	294	87	191	2155	1944	85	2775	1903	665
1-18	804	95	611	294	100	182	2155	2052	61	2775	1890	563
1-23	804	86	617	294	94	188	2155	1955	68	2775	2033	553
1-28	804	88	516	294	76	160	2155	2075	58	2775	2106	466
###												
2-7	804	105	591	294	59	207	2155	1988	73	2775	1937	513
2-12	804	87	639	294	74	192	2155	1919	96	2775	1837	558
2-17	804	112	602	294	83	182	2155	1924	97	2775	1886	545
2-22	804	109	597	294	78	188	2155	1926	67	2775	1916	496
2-27	804	99	578	294	78	179	2155	1910	89	2775	1825	506
3-3	825	112	596	336	78	198	2545	2396	65	2785	1732	534
3-8	825	101	650	336	86	236	2545	2410	61	2785	2135	575
3-13	825	87	559	336	77	210	2545	2494	37	2785	2122	358
3-18	832	51	645	282	70	191	2169	1913	51	2676	1967	551
3-23	775	58	547	282	78	169	2169	1974	31	2676	1658	471
3-28	775	87	507	282	79	152	2169	1998	38	2676	1579	456
4-2	775	94	542	282	81	164	2169	2203	00	2676	1974	369
4-7	775	66	555	282	74	163	2169	1866	71	2676	1751	464
4-12	775	89	557	282	84	170	2169	2008	20	2676	1929	447
4-17	775	106	553	282	79	165	2169	1958	39	2676	1888	390
4-22	775	124	517	282	78	155	2169	1970	53	2676	1894	388
4-27	775	112	544	282	76	165	2169	1960	31	2676	1783	439
5-2	775	103	544	282	79	160	2169	2020	00	2676	2024	345
5-7	775	83	500	282	87	150	2169	1858	15	2676	1872	327

# See footnotes to Table 286.



TABLE 289

Bobby  
66 months

## COMPLEX CARBOHYDRATES IN INTAKE AND FECES

*Values in grams per day*

Date	LIGNIN		CELLULOSE		HEMICELLULOSE		
	Intake	Feces	Intake	Feces	INTAKE		Feces
					Total	Stable	
9-30	1.28	6.58	2.08	0.70	2.17	1.72	2.24
10-5	1.28	4.11	2.08	1.00	2.17	1.72	1.59
10-10	1.28	2.97	2.08	0.64	2.17	1.72	1.08
10-15	1.28	2.64	2.08	0.38	2.17	1.72	1.29
***							
10-25	1.28	1.62	2.08	0.22	2.17	1.72	0.62
10-30	1.28	2.79	2.08	0.47	2.17	1.72	1.07
11-4	1.62	1.80	2.03	0.40	1.82	1.43	0.76
11-9	1.62	1.63	2.03	0.51	1.82	1.43	0.77
***							
11-24	1.63	2.03	2.05	1.40	1.88	1.50	1.15
11-29	1.61	3.14	2.02	0.03	1.76	1.36	0.83
12-4	1.67	1.95	2.27	1.28	2.12	1.59	0.96
12-9	1.67	2.01	2.27	0.96	2.12	1.59	0.92
12-14	1.67	1.75	2.27	0.83	2.12	1.59	0.72
12-19	1.67	2.31	2.27	0.89	2.12	1.59	0.93
12-24	1.67	1.46	2.27	0.70	2.12	1.59	0.72
12-29	1.67	1.74	2.27	1.01	2.12	1.59	0.79
1-3	1.67	1.58	2.27	1.18	2.12	1.59	0.80
1-8	1.67	2.50	2.27	1.08	2.12	1.59	1.08
1-13	1.67	2.44	2.27	1.84	2.12	1.59	1.38
1-18	1.66	1.79	2.25	1.19	2.06	1.52	0.84
1-23	1.67	1.82	2.27	1.08	2.12	1.59	0.90
1-28	1.67	2.24	2.27	1.24	2.12	1.59	1.02
***							
2-7	1.67	2.42	2.27	1.82	2.12	1.59	1.30
2-12	1.67	2.35	2.27	1.68	2.12	1.59	1.22
2-17	1.67	1.69	2.27	1.16	2.12	1.59	0.82
2-22	1.67	2.42	2.27	1.98	2.12	1.59	1.29
2-27	1.67	2.17	2.27	1.89	2.12	1.59	1.42
3-3	1.46	1.80	2.61	1.32	2.61	1.98	1.43
3-8	1.46	2.22	2.61	1.71	2.61	1.98	1.62
3-13	1.46	1.10	2.61	0.92	2.61	1.98	0.96
3-18	1.33	1.71	2.32	1.18	2.47	1.89	1.46
3-23	1.33	1.43	2.32	0.89	2.47	1.89	1.30
3-28	1.36	1.59	2.37	0.72	2.65	2.09	1.41
4-2	1.33	1.58	2.32	1.14	2.47	1.89	1.03
4-7	1.33	1.63	2.32	1.00	2.47	1.89	0.92
4-12	1.33	2.29	2.32	1.28	2.47	1.89	1.66
4-17	1.33	1.96	2.32	1.23	2.47	1.89	1.36
4-22	1.33	2.04	2.32	1.27	2.47	1.89	1.54
4-27	1.33	1.15	2.32	0.81	2.47	1.89	0.86
5-2	1.33	1.96	2.32	1.10	2.47	1.89	1.30
5-7	1.33	1.84	2.32	0.64	2.47	1.89	1.26

\* See case history, page 878.

TABLE 290

Bobby  
71 months

## NITROGEN PARTITION OF URINE

*Values in grams of nitrogen per day*

Date	Total nitrogen	Urea	Ammonia	Creatinine + Creatine	Creatinine	Uric acid
3-28	8.35	7.311	0.329	0.291	0.143	0.100
3-29	8.00	7.036	0.324	0.298	0.164	0.094
3-30	7.55	6.389	0.290	0.318	0.169	0.099
3-31	8.02	6.986	0.314	0.349	0.131	0.105
4-1	9.03	8.121	0.339	0.369	0.150	0.118
4-2	8.10	6.684	0.276	0.335	0.143	0.112
4-3	8.26	7.325	0.255	0.347	0.151	0.129
4-4	8.14	7.128	0.272	0.374	0.154	0.099
4-5	8.50	7.261	0.299	0.388	0.166	0.129
4-6	8.61	7.815	0.245	0.378	0.162	0.132
4-7	7.54	6.832	0.268	0.264	0.125	0.102
4-8	7.68	6.738	0.262	0.294	0.136	0.109
4-9	8.83	7.906	0.294	0.359	0.141	0.102
4-10	6.46	5.628	0.172	0.189	0.119	0.097
4-11	11.34	9.333	0.387	0.467	0.179	0.139
4-12	9.26		0.280	0.392	0.179	0.113
4-13	8.77	7.702	0.278	0.338	0.166	0.122
4-14	8.74	7.621	0.259	0.355	0.160	0.113
4-15	8.87	7.865	0.275	0.330	0.149	0.115
4-16	8.75	7.772	0.338	0.362	0.149	0.114
4-17	8.83	7.954	0.312	0.380	0.168	0.122
4-18	9.01	8.007	0.303	0.352	0.180	0.123
4-19	8.63	7.823	0.265	0.312	0.164	0.118
4-20	8.35	7.349	0.259	0.272	0.156	0.115
4-21	8.81	7.867	0.325	0.297	0.151	0.121
4-22	6.45	5.692	0.214	0.244	0.110	0.095
4-23	10.38	9.255	0.411	0.359	0.201	0.122
4-24	9.11	7.683	0.317	0.318	0.193	0.111
4-25	8.51	7.658	0.302	0.223	0.145	0.124
4-26	8.64	7.689	0.299	0.341	0.169	0.119
4-27	9.54	8.479	0.309	0.339	0.158	0.117
4-28	8.46	7.424	0.282	0.339	0.170	0.116
4-29	8.50	7.434	0.358	0.295	0.144	0.114
4-30	8.21	7.333	0.291	0.373	0.160	0.101
5-1	8.46	7.336	0.318	0.318	0.156	0.117
5-2	9.10	8.097	0.325	0.307	0.179	0.134
5-3	8.81	7.786	0.346	0.290	0.157	0.121
5-4	8.52	7.817	0.281	0.288	0.151	0.116
5-5	8.26	7.312	0.262	0.246	0.153	0.110
5-6	8.69	7.815	0.311	0.320	0.153	0.102
5-7	8.09	7.266	0.276	0.256	0.142	0.108
5-8	8.18	7.253	0.261	0.317	0.192	0.124
5-9	7.50	6.724	0.276	0.210	0.145	0.091
5-10	8.94	7.942	0.288	0.323	0.212	0.127
5-11	8.23	7.788	0.302	0.243	0.162	0.121

The age given is the initial age at start of study.

TABLE 291

Bobby  
66 months

## IRON IN INTAKE, URINE AND FECES

*Values are averages per day*

Date	Intake	Urine	Feces	Date	Intake	Urine	Feces	Date	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mo.-day	mg.	mg.	mg.	mo.-day	mg.	mg.	mg.
9-30	7.39	0.23	11.20	12-24	8.03	0.02	5.44	3-3	9.18	0.26	7.60
10-5	7.39	0.26	5.70	12-29	8.03	0.13	5.31	3-8	9.18	2.30	11.00
10-10	7.39	0.19	5.72	1-3	8.03	0.06	5.20	3-13	9.18	0.46	5.12
10-15	7.39	0.15	5.85					3-18	8.20	0.24	6.88
§§§				1-8	8.03	0.13	7.80				
10-25	7.39	0.03	3.82	1-13	8.11	0.12	7.46	3-23	8.20	0.20	7.20
10-30	7.39	0.35	7.74	1-18	8.11	0.14	5.88	3-28	8.20	0.29	6.77
11-4	7.07	0.21	5.62	1-23	8.11	0.20	5.85	4-2	8.20	0.30	7.90
11-9	7.07	0.16	5.02	1-28	8.11	0.16	6.21	4-7	8.20	0.15	4.88
§§§				§§§				4-12	8.20	0.21	10.80
11-24	7.07	0.02	7.05	2-7	8.13	0.40	7.25				
11-29	7.07	0.04	4.84	2-12	8.13	0.11	5.47	4-17	8.20	0.13	8.14
12-4	8.03	0.08	5.48	2-17	8.13	0.17	5.20	4-22	8.20	0.29	8.04
12-9	8.03	0.04	4.84	2-22	8.13	0.00	7.05	4-27	8.20	0.17	4.66
12-14	8.03	0.04	4.72	2-27	8.13	0.18	6.12	5-2	8.20	0.16	8.55
12-19	8.03	0.12	6.98					5-7	8.20	0.11	8.31

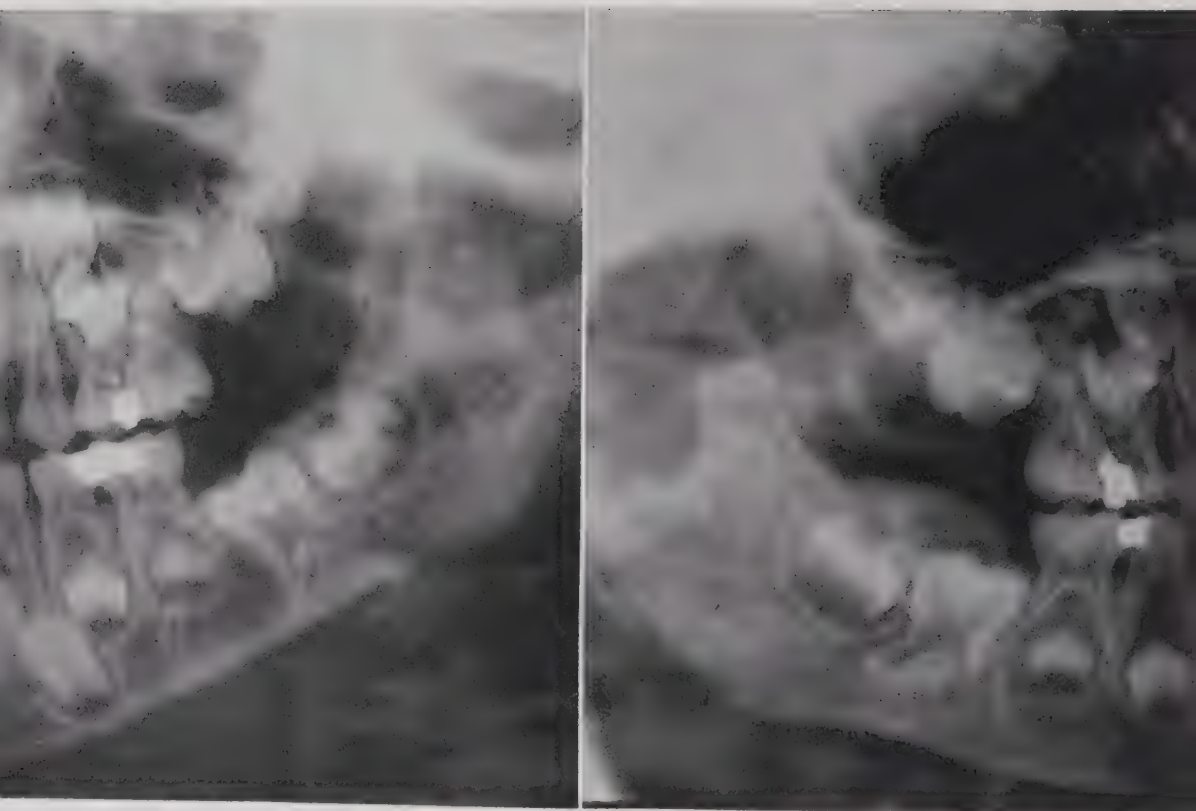
The age given is the initial age at start of study. Dates given are first days of five-day balance periods.  
 §§§ See case history, page 878 for explanation for missing periods.

TABLE 292

Bobby  
72 months

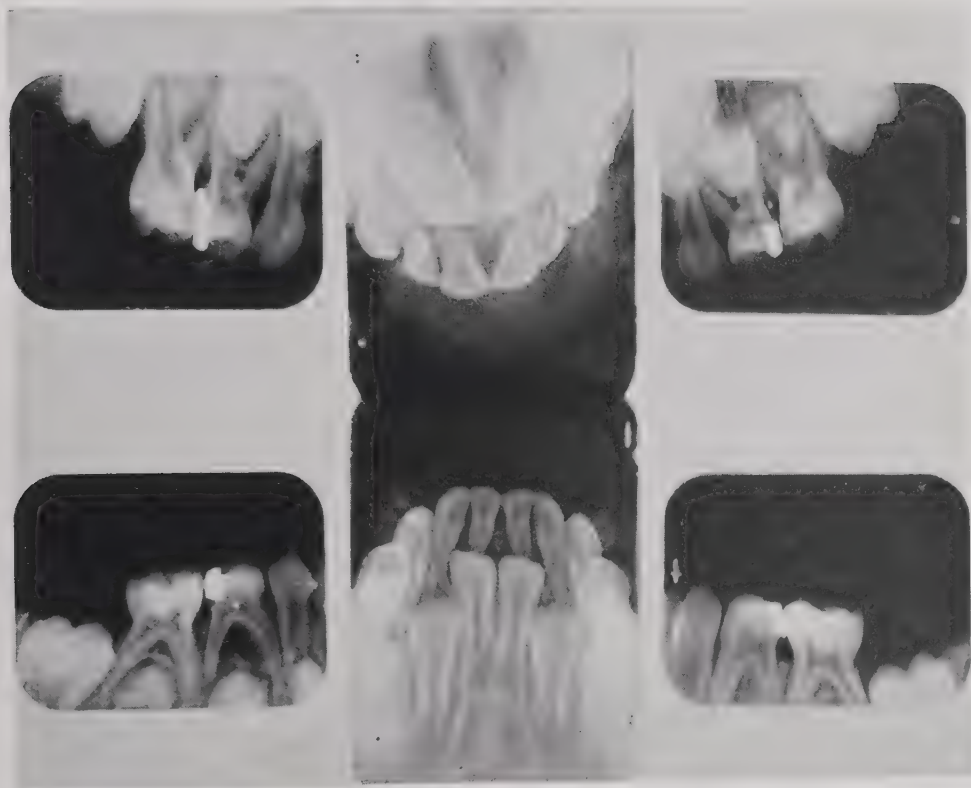
## TEMPERATURE AND PULSE

Date	Temper- ature	Pulse	Date	Temper- ature	Pulse	Date	Temper- ature	Pulse
4-7	99.1	100	4-19	98.7	88	5-2	99.0	92
4-8	98.1	88	4-20	98.2	90	5-3	98.6	96
4-9	98.2	94	4-21	98.2	89	5-4	98.3	96
4-10	98.2	82	4-22	99.0	92	5-5	99.0	92
4-11	99.1	100	4-23	98.8	90	5-6	98.0	86
4-12	98.2	84	4-24	98.2	96	5-7	98.2	86
			4-25	99.1	90			
4-13	98.6	98	4-26	99.4	100	5-8	98.2	81
4-14	98.6	92	4-27	99.4	96	5-9	99.0	96
4-15	98.4	92	4-28	99.0	96	5-10	98.4	88
4-16	98.3	85	4-29	98.2	96	5-11	99.0	88
4-17	99.0	80	4-30	99.2	100	5-12	98.2	92
4-18	96.8	92	5-1	99.2	108	5-13	99.0	92



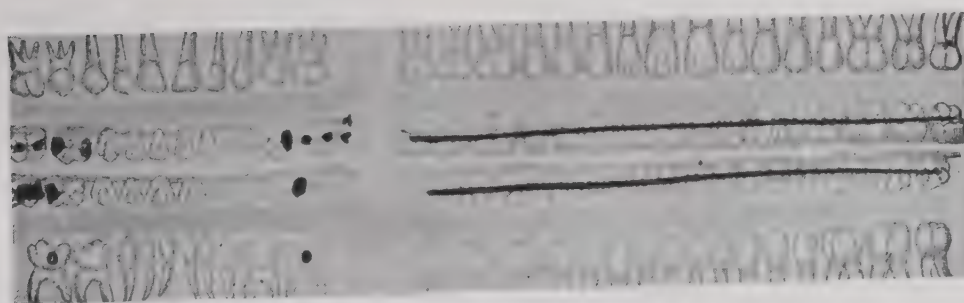
## BOBBY

FIGURE 425. Actual size reproduction of roentgenogram of jaws.  
Chronological age 68 months.



BOBBY

FIGURE 426. Roentgenograms of teeth, age 68 months.



BOBBY

FIGURE 427. Dental examination, age 67 months.





FIGURE 428. BOBBY, age 65 months.



BOBBY

FIGURE 429. Actual size reproduction of roentgenogram of left hand.  
Chronological age 71 months.



## BOBBY

FIGURE 430. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 71 months.



BOBBY

FIGURE 431. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 71 months.



BOBBY

FIGURE 432. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 71 months.





BOBBY

FIGURE 433. Actual size reproduction of roentgenogram of left hip.  
Chronological age 71 months.



BOBBY

FIGURE 434. Actual size reproduction of roentgenogram of left knee.  
Chronological age 71 months.



BOBBY

FIGURE 435. Actual size reproduction of roentgenogram of left knee.  
Chronological age 71 months.



BOBBY

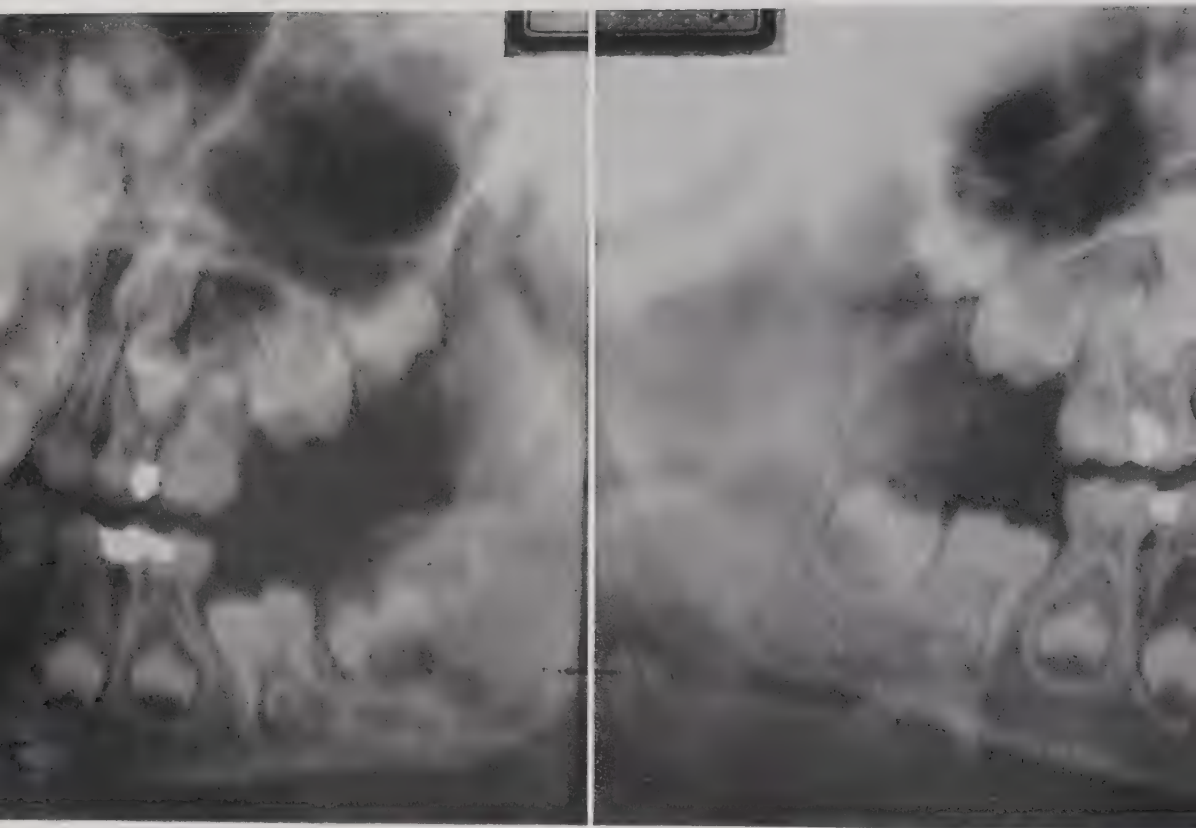
FIGURE 436. Actual size reproduction of roentgenogram of left foot.  
Chronological age 71 months.



BOBBY

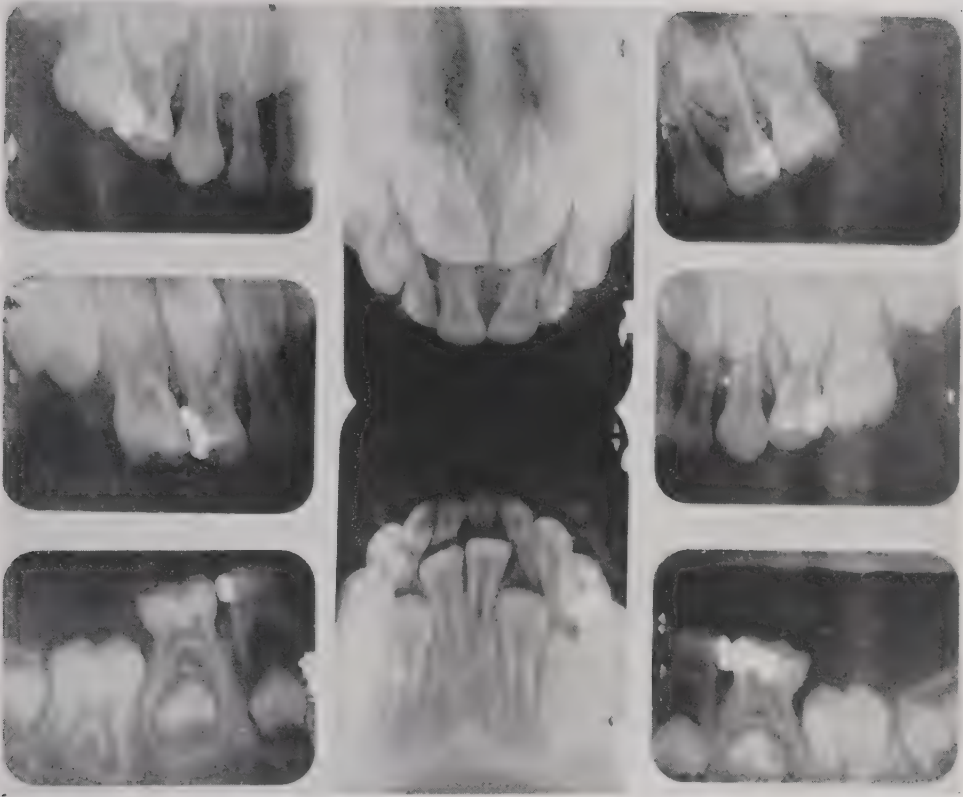
FIGURE 437. Actual size reproduction of roentgenogram of left foot.  
Chronological age 71 months.





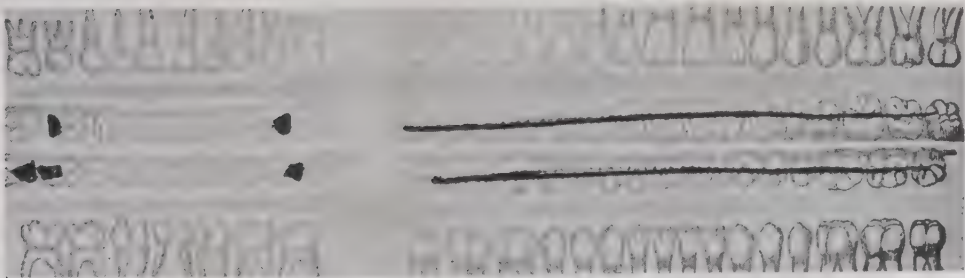
## BOBBY

FIGURE 438. Actual size reproduction of roentgenogram of jaws.  
Chronological age 73 months.



BOBBY

FIGURE 439. Roentgenograms of teeth, age 73 months.



BOBBY

FIGURE 440. Dental examination, age 73 months.



BOBBY

FIGURE 441. Actual size reproduction of roentgenogram of left hand.  
Chronological age 73 months.



BOBBY

FIGURE 442. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 73 months.



BOBBY

FIGURE 443. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 73 months.





BOBBY

FIGURE 444. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 73 months.



BOBBY

FIGURE 445. Actual size reproduction of roentgenogram of left hip.  
Chronological age 73 months.



BOBBY

FIGURE 446. Actual size reproduction of roentgenogram of left knee.  
Chronological age 73 months.

**BOBBY**

FIGURE 447. Actual size reproduction of roentgenogram of left knee.  
Chronological age 73 months.



BOBBY

FIGURE 448. Actual size reproduction of roentgenogram of left foot.  
Chronological age 73 months.





BOBBY

FIGURE 449. Actual size reproduction of roentgenogram of left foot.  
Chronological age 73 months.



FIGURE 450. BOBBY, age 101 months.

## ROENTGENOGRAMS OF PROGRESS OF BA

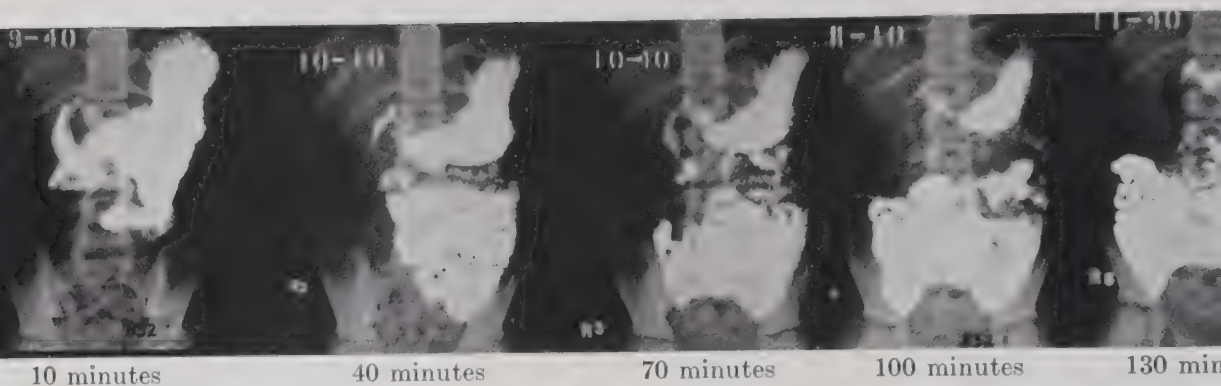


FIGURE 451. Progress of meal consisting of 2 ounces of barium sulfate and 4 ounces of water. The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

BOBBY  
Age, 81 months

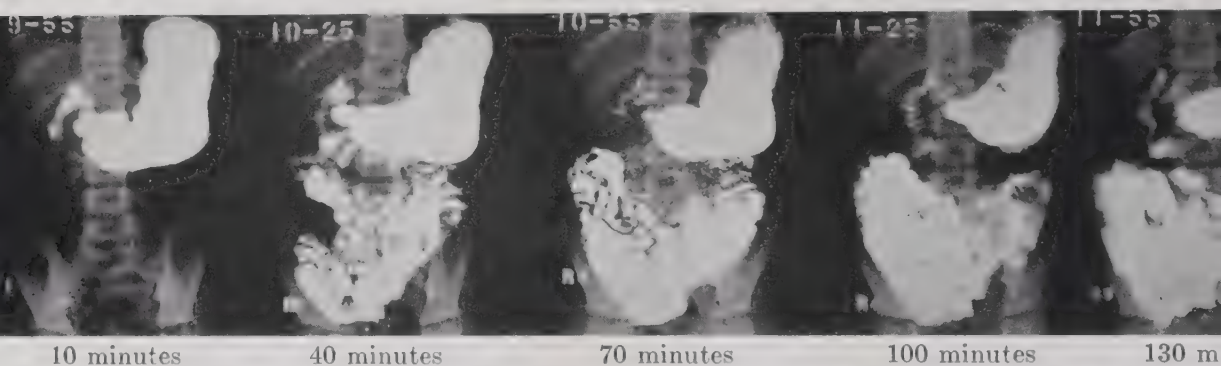


FIGURE 452. Progress of meal consisting of 2 ounces of barium sulfate, 3 ounces of water and 1 ounce of corn syrup (approximately 30 per cent glucose, 61 per cent carbohydrate). The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

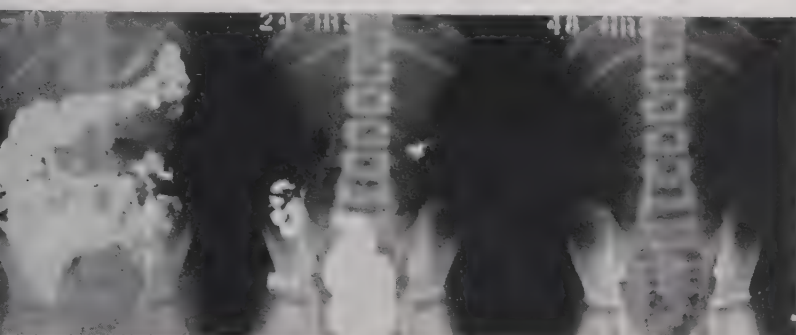
BOBBY  
Age, 81 months



FIGURE 453. Progress of meal consisting of 2 ounces of barium sulfate and 4 ounces of standard and pasteurized milk (3.5 per cent fat). The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

BOBBY  
Age, 81 months

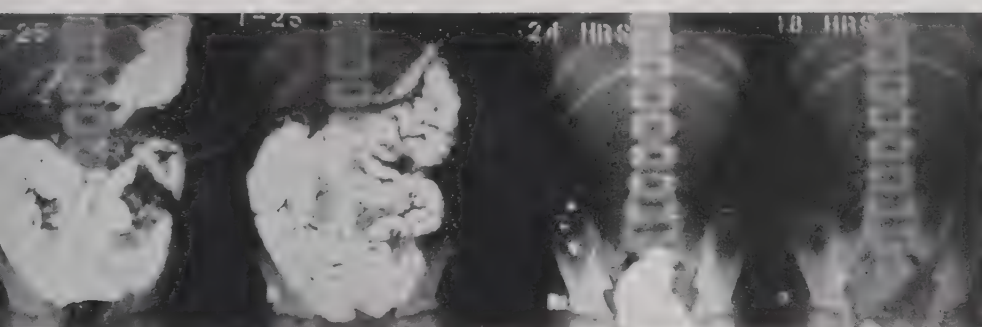
## MEALS THROUGH GASTROINTESTINAL TRACT



160 minutes

24 hours

48 hours



160 minutes

220 minutes

24 hours

48 hours



24 hours



## ROENTGENOGRAMS OF PROGRESS OF BARI

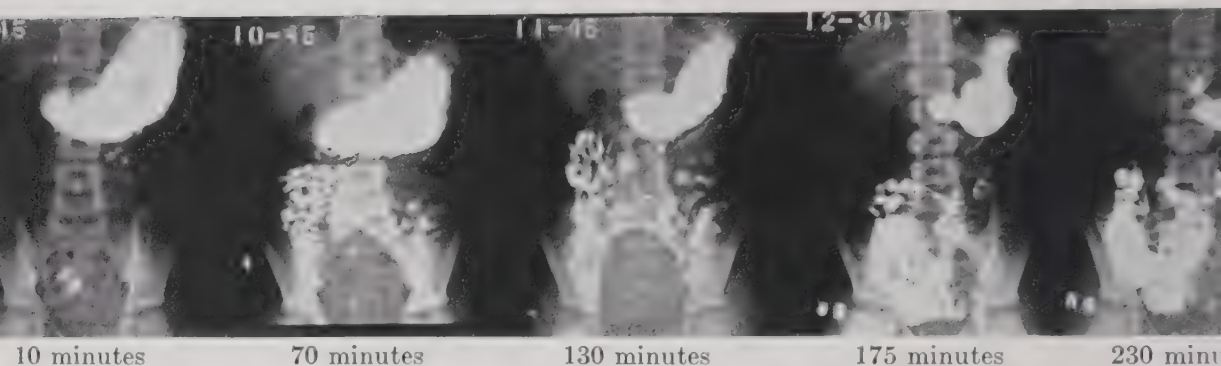


FIGURE 454. Progress of meal consisting of 40 grams of barium sulfate mixed with 100 grams of raw, ground lean meat, baked twenty to thirty minutes and ingested with 200 ml. of water. In the 290 gm. of barium, meat and water ingested (about 50 gm. of water were lost in cooking) the concentrations of fat and protein were approximately 3.5 and 7 per cent, respectively.

BOBBY  
Age, 81 months

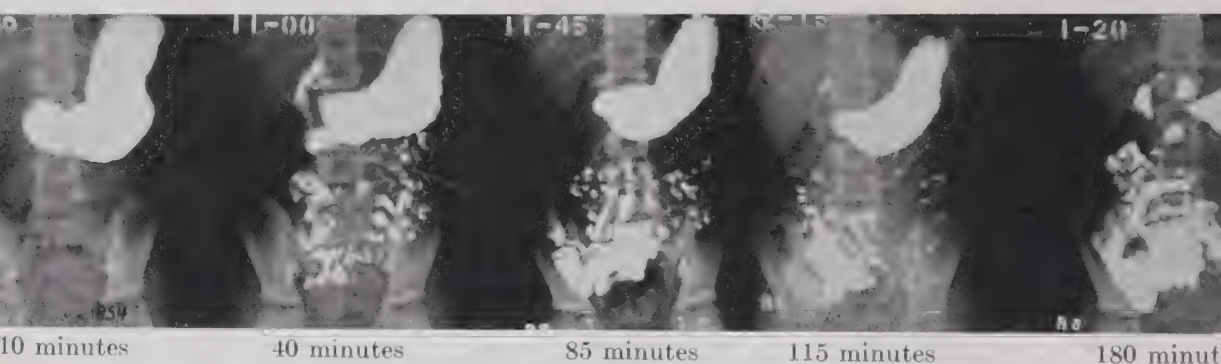


FIGURE 455. Progress of meal consisting of 2 ounces of barium sulfate and 4 ounces of cream (20 per cent fat). The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

BOBBY  
Age, 81 months

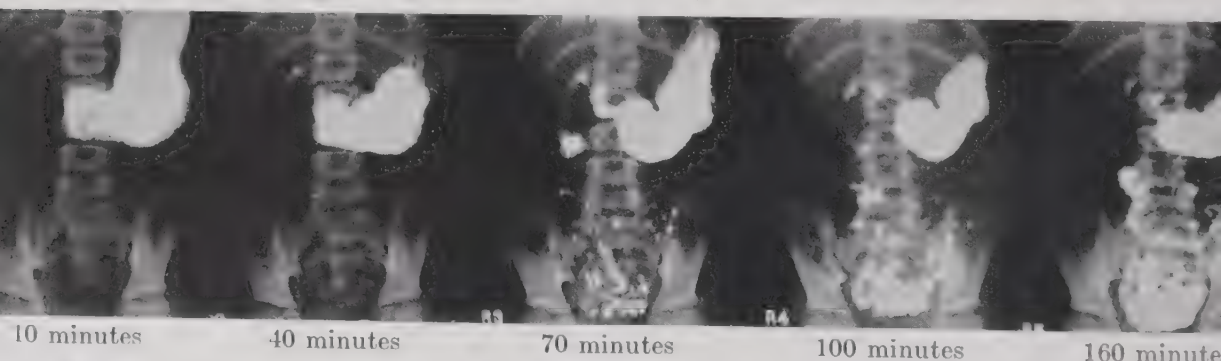
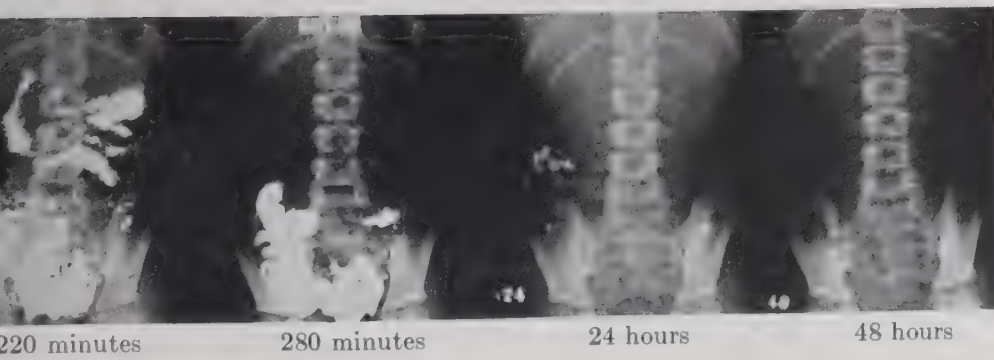
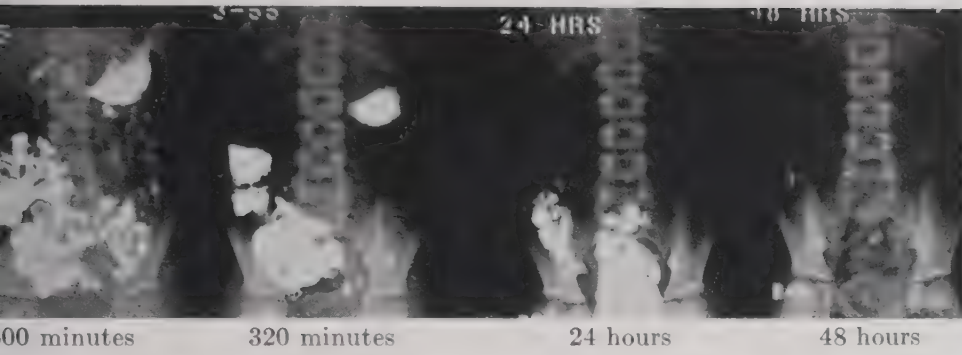


FIGURE 456. Progress of meal consisting of 2 ounces of barium sulfate and 4 ounces of standard pasteurized milk (3.5 per cent fat). The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

BOBBY  
Age, 101 months



## EALS THROUGH GASTROINTESTINAL TRACT



## ROENTGENOGRAMS OF PROGRESS OF BAR



FIGURE 457. Progress of meal consisting of 2 ounces of barium sulfate, 4 ounces of standard pasteurized milk and 0.2-0.3 gm. carmine. The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

BOBBY  
Age, 101 months

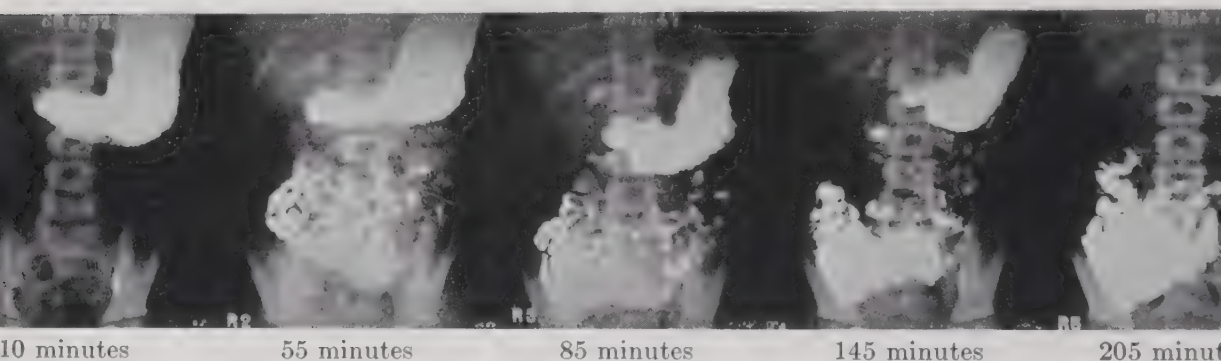


FIGURE 458. Progress of meal consisting of 2 ounces of barium sulfate and 4 ounces of evaporated milk, diluted 1:1 with water. The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

BOBBY  
Age, 101 months

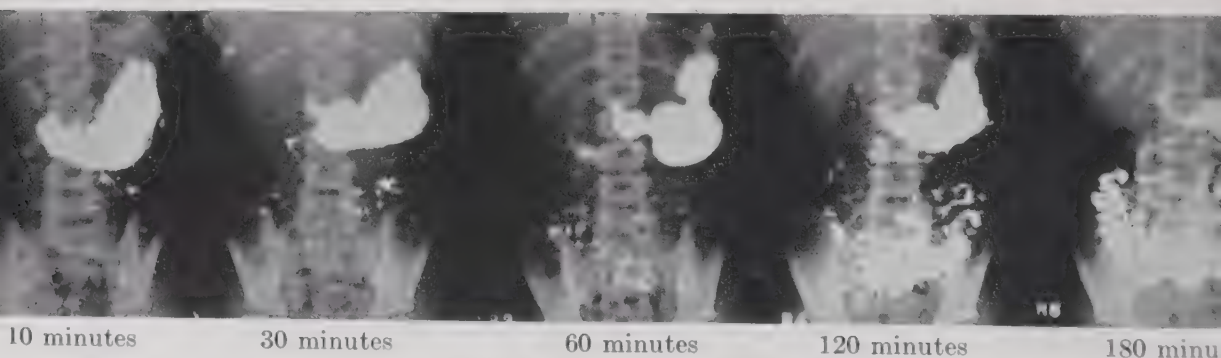


FIGURE 459. Progress of meal consisting of 2 ounces of barium sulfate and 4 ounces of base-exchanged milk. The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

BOBBY  
Age, 101 months

## EXCRETION THROUGH GASTROINTESTINAL TRACT



10 minutes

24 hours

48 hours



265 minutes

24 hours

48 hours



250 minutes

24 hours

48 hours



BOBBY

FIGURE 460. Actual size reproduction of roentgenogram of left hand.  
Chronological age 87 months.





## BOBBY

FIGURE 461. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 87 months.





## BOBBY

FIGURE 462. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 87 months.



BOBBY

FIGURE 463. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 87 months.



BOBBY

FIGURE 464. Actual size reproduction of roentgenogram of left hip.  
Chronological age 87 months.



BOBBY

FIGURE 465. Actual size reproduction of roentgenogram of left knee.  
Chronological age 87 months.



## BOBBY

FIGURE 466. Actual size reproduction of roentgenogram of left knee.  
Chronological age 87 months.





BOBBY

FIGURE 467. Actual size reproduction of roentgenogram of left foot.  
Chronological age 87 months.



BOBBY

FIGURE 468. Actual size reproduction of roentgenogram of left foot.  
Chronological age 87 months.

TABLE 293

Bobby  
113 monthsFOOD INTAKE  
*Values in grams per day*

Food	DATE	Food	DATE	Food	DATE
	9-18 to 11-12		9-18 to 11-12		9-18 to 11-12
Apple	100	Cheese, American	20	Orange juice, canned	100
Banana	150	Corn flakes	30	Peanut butter	16
Beef, lean	100	Egg, whole	100	Peas, quick frozen	25
Bread, white	50	Gelatin	3	Potato	60
Bread, whole wheat	50	Graham cracker	36	Salt	2
Butter	30	Honey	15	Sugar (average)	23
Cabbage	25	Lettuce	25	Tomato juice	60
Carrot	50	Milk, fluid, irradiated	500	Water (average)	548

TABLE 294

Bobby  
113 months

## BODY LENGTH AND WEIGHT—INTAKE AND ELIMINATION

Date	Recumbent length*	Weight*	INTAKE			AVERAGE DAILY HEAT OF COMBUSTION			FECES				
			AVERAGE DAILY						AVERAGE DAILY			Laxation rate†	Elimination time‡
			Dry wt.‡	Total water†	Fat	In-take	Urine	Feces	Wet wt.	Dry wt.‡	Fat		
mo.-day	cm.	kg.	gm.	gm.	gm.	Cal.	Cal.	Cal.	gm.	gm.	gm.		hours
9-18	141	29.62	409	1859	78.5	2082	86	122	132.6	25.5	2.8	2.4	11
9-23	141	29.07	403	1670	80.5	2069	92	120	106.4	23.2	2.6	2.2	26
9-28	141	29.14	439	1612	88.1	2250	86	113	113.4	23.1	2.7	1.4	30
10-3	141	28.96	410	1664	83.4	2098	92	104	88.4	21.7	2.6	1.8	26
10-8	141	29.02	431	1781	84.2	2185	87	116	97.8	23.8	2.4	2.0	26
10-13	141	28.93	415	1690	83.0	2130	91	116	110.6	23.8	2.5	1.6	26
10-18	141	29.12	480	1641	84.2	2392	90	105	94.2	21.1	3.1	1.6	12
10-23	141	29.16	473	1653	83.0	2364	89	118	121.2	24.7	2.5	1.8	12
10-28	141	29.16	430	1689	80.5	2158	87	116	113.4	23.8	3.1	1.6	35
11-2	141	29.18	414	1693	82.7	2135	86	126	112.4	24.2	4.1	1.8	30
11-7	141	28.11	434	1613	82.1	2199	88	150	145.6	30.1	6.6	2.6	11

The age given is the initial age at start of study. Dates given are first days of five-day balance periods.

\* See Table 277 for actual values and method of smoothing.

‡ Based on vacuum-dried food and cryochem-dried feces. Corresponding values for alcohol-dried food and oven-dried feces are given in Table 597, page 1421.

† Drinking water plus water in foods.

‡ Average number of defecations per day.

§ Elapsed time between ingestion and defecation of marker used to separate feces of five-day periods.

TABLE 295

Bobby  
113 months

## POSITIVE MINERALS IN INTAKE, URINE, FECES

*Values are averages per day*

Date	CALCIUM			MAGNESIUM			SODIUM			POTASSIUM		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
9-18	928	145	665	284	102	158	3032	2702	33	3256	2620	387
9-23	961	198	735	299	110	164	2966	2725	18	3170	2524	328
9-28	914	110	733	277	94	168	3053	2626	17	3176	2590	358
10-3	944	121	643	305	104	147	3043	2684	12	3252	2607	253
10-8	907	166	699	282	114	168	2950	2746	13	3252	2665	331
10-13	940	164	688	205	110	160	3052	2644	24	3268	2658	323
10-18	933	142	682	294	113	163	3002	2699	18	3266	2691	284
10-23	944	154	732	293	40	183	2974	2690	34	3293	2800	345
10-28	932	129	666	281	114	162	3008	2646	34	3230	2737	338
11-2	961	106	679	284	92	160	2980	2472	23	3277	2376	415
11-7	995	106	745	296	63	198	2909	2612	62	3332	2160	623

TABLE 296

Bobby  
113 months

## NITROGEN AND NEGATIVE MINERALS IN INTAKE, URINE, FECES

*Values are averages per day*

Date	NITROGEN			PHOSPHORUS			CHLORINE			SULFUR		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
9-18	12.69	10.42	1.62	1437	956	425	4403	4188	34	984	727	163
9-23	12.47	10.76	1.63	1455	926	474	4325	4000	26	933	729	159
9-28	13.05	10.40	1.56	1432	926	472	4376	3960	33	1011	693	142
10-3	13.54	11.28	1.39	1488	949	417	4312	4030	21	965	774	140
10-8	12.86	10.97	1.63	1429	966	477	4141	4138	27	1032	770	146
10-13	13.18	10.99	1.55	1492	940	466	4270	4028	28	868	738	145
10-18	13.05	11.05	1.27	1492	914	442	4471	4079	22	1006	774	129
10-23	13.45	10.94	1.61	1494	905	445	4414	4059	38	1058	760	146
10-28	13.14	10.69	1.55	1413	916	439	4275	4014	32	924	760	148
11-2	13.26	10.44	1.64	1450	813	505	4426	3600	31	944	736	154
11-7	13.00	10.57	1.68	1522	705	624	4315	3782	41	983	706	156

TABLE 297

Bobby  
113 months

## COMPLEX CARBOHYDRATES IN INTAKE AND FECES

*Values in grams per day*

Date	LIGNIN		CELLULOSE		HEMICELLULOSE		
	Intake	Feces	Intake	Feces	INTAKE		Feces
					Total	Stable	
9-18	1.25	1.56	2.74	0.80	2.80	1.61	0.78
9-23	1.25	1.21	2.74	0.66	2.80	1.61	0.70
9-28	1.25	1.21	2.74	0.73	2.80	1.61	0.57
10-3	1.25	1.13	2.74	0.69	2.80	1.61	0.68
10-8	1.25	1.07	2.74	0.67	2.80	1.61	0.70
10-13	1.25	1.57	2.74	0.83	2.80	1.61	0.78
10-18	1.25	1.28	2.74	0.67	2.80	1.61	0.68
10-23	1.25	1.19	2.74	0.92	2.80	1.61	0.58
10-28	1.25	1.61	2.74	0.72	2.80	1.61	0.63
11-2	1.25	1.19	2.74	0.60	2.80	1.61	0.60
11-7	1.25	1.30	2.74	0.70	2.80	1.61	0.74

TABLE 298

Bobby  
113 months

## FAT PARTITION OF FECES

*Values in grams per day*

Date	Unsaponi- fiable	Neutral fat	Free fatty acids	Soap
9-18	1.10	0.11	0.24	1.46
9-23	0.88	0.32	0.23	1.24
9-28	0.89	0.29	0.27	1.27
10-3	0.82	0.29	0.24	1.23
10-8	0.96	0.21	0.24	1.02
10-13	1.02	0.18	0.25	1.07
10-18	1.01	0.36	0.27	1.42
10-23	1.03	0.27	0.25	0.99
10-28	0.87	0.38	0.25	1.57
11-2	1.07	0.51	0.27	2.29
11-7	1.29	0.75	0.33	4.22

The age given is the initial age at start of study. Dates given are first days of five-day balance periods.



## NITROGEN PARTITION OF URINE

*Values in grams of nitrogen per day*

Date	Urine volume	Total nitrogen	Urea	Ammonia	Creatinine + Creatine	Creatinine	Uric acid
9-18	1020	9.500	7.913	0.303	0.193	0.121	0.136
9-19	1160	10.951	9.236	0.368	0.440	0.271	0.127
9-20	1040	11.505	9.970	0.430	0.443	0.230	0.113
9-21	1275	10.122	8.632	0.308	0.454	0.244	0.092
9-22	637	10.334	8.802	0.358	0.368	0.232	0.138
9-23	628	10.650	9.055	0.328	0.425	0.231	0.161
9-24	440	7.514	6.588	0.162	0.300	0.163	0.137
9-25	875	14.128	11.119	0.464	0.500	0.282	0.182
9-26	880	10.966	8.682	0.338	0.390	0.236	0.156
9-27	590	10.002	8.781	0.339	0.338	0.236	0.138
9-28	580	10.380	8.942	0.368	0.336	0.217	0.145
9-29	790	11.361	9.653	0.346	0.362	0.234	0.124
9-30	865	10.391	8.599	0.344	0.348	0.232	0.132
10-1	890	9.656	8.201	0.346	0.313	0.207	0.114
10-2	578	10.173	8.658	0.307	0.372	0.239	0.126
10-3	770	11.257	9.648	0.384	0.394	0.236	0.118
10-5	478	8.034	6.950	0.320	0.296	0.165	0.114
10-6	835	14.639	12.392	0.566	0.461	0.287	0.137
10-7	785	11.285	9.918	0.412	0.359	0.234	0.112
10-8	608	10.071	8.783	0.287	0.356	0.227	0.130
10-9	501	8.098	6.989	0.261	0.308	0.163	0.102
10-10	732	14.286	12.348	0.592	0.454	0.304	0.133
10-11	815	11.231	9.740	0.380	0.379	0.241	0.119
10-12	1090	11.326	9.752	0.482	0.406	0.220	0.127
10-13	1010	11.460	9.932	0.448	0.391	0.235	0.120
10-14	815	11.242	9.871	0.392	0.383	0.224	0.130
10-15	885	10.495	9.092	0.340	0.376	0.199	0.126
10-16	795	10.782	9.118	0.386	0.376	0.237	0.119
10-17	1100	11.183	9.393	0.474	0.360	0.220	0.135
10-18	737	10.986	9.457	0.443	0.365	0.214	0.129
10-19	685	11.368	9.922	0.438	0.348	0.232	0.115
10-20	810	10.790	9.316	0.354	0.354	0.236	0.127
10-21	1055	11.310	9.916	0.445	0.350	0.248	0.118
10-22	940	10.680	8.890	0.362	0.380	0.234	0.129
10-23	805	10.390	8.910	0.390	0.352	0.211	0.116
10-24	1010	11.047	9.610	0.434	0.347	0.232	0.126
10-25	758	10.890	9.224	0.496	0.327	0.224	0.125
10-26	1055	11.383	9.668	0.680	0.396	0.251	0.141
10-27	890	11.031	9.302	0.510	0.368	0.222	0.133
10-28	1160	10.962	9.432	0.498	0.354	0.222	0.135
10-29	830	10.580	9.102	0.424	0.348	0.237	0.123
10-30	795	10.316	8.760	0.400	0.350	0.213	0.122
10-31	870	10.696	9.172	0.486	0.341	0.234	0.107
11-1	955	10.654	9.012	0.432	0.382	0.232	0.123
11-2	1115	11.256	9.687	0.435	0.373	0.226	0.133
11-3	960	11.206	9.426	0.438	0.408	0.254	0.131
11-4	900	10.815	8.999	0.428	0.392	0.262	0.115
11-5	1025	11.167	9.669	0.315	0.399	0.243	0.155
11-6	378	7.818	6.546	0.364	0.270	0.219	0.096
11-7	540	11.624	10.220	0.370	0.350	0.219	0.154
11-8	545	9.736	8.403	0.367	0.289	0.217	0.151
11-9	1225	9.940	8.714	0.526	0.309	0.215	0.131
11-10	610	10.566	9.142	0.338	0.334	0.236	0.144
11-11	1105	10.832	9.516	0.390	0.334	0.226	0.143

The age given is the initial age at start of study. Urine volumes are in milliliters.

TABLE 300

Bobby  
113 months

## VOLUME, WEIGHT AND SULFUR PARTITION OF URINE

*Values are averages per day*

Date	Volume	Specific gravity	Wet weight	Dry weight*	SULFUR PARTITION		
					Inorganic	Ethereal	Neutral
mo.-day	ml.		gm.	gm.	mg.	mg.	mg.
9-18†	1026	1.025	1052	45.1	—	—	—
9-23†	683	1.031	704	45.8	—	—	—
9-28†	741	1.030	763	44.9	592	42	59
10-3†	700	1.030	721	46.8	636	40	98
10-8†	749	1.031	772	45.9	632	41	97
10-13†	921	1.023	942	46.3	627	37	74
10-18†	845	1.026	867	46.9	643	36	95
10-23†	904	1.023	925	45.6	642	34	84
10-28†	922	1.030	950	45.6	610	46	104
11-2†	876	1.030	902	42.7	594	57	85
11-7†	805	1.024	824	42.9	—	—	—
11-7‡	—	—	—	—	666	46	32
11-8‡	—	—	—	—	547	46	67
11-9‡	—	—	—	—	583	51	72
11-10‡	—	—	—	—	606	54	62
11-11‡	—	—	—	—	630	45	73

\* Cryochem dried.

† Determined upon five-day composites and corrected for precipitate solubility.

‡ Determined upon daily urine collections and corrected for precipitate solubility.

TABLE 301

Bobby  
113 months

## SALIVA CULTURE ESTIMATION OF CARIES ACTIVITY

Date	QUANTITATIVE*			QUALITATIVE†	COLOR REACTION TEST‡			
	Lacto- bacilli	Cocci	Yeast		hours after preparation			
					24	48	72	96
mo.-day	colonies per ml. of saliva							
9-22	32,400	0	3,000	+	0	3	4	4
10-23	3,000	0	12,000	+	0	4	4	4
10-31	3,400	—	4,000	+	0	4	4	4
11-7	15,000	—	2,000	+	0	4	4	4
11-14	36,000	50	450	+	3	4	4	4

\* 0.2 ml. saliva to tomato agar plate.

† 1.0 ml. saliva in acid glucose broth.

‡ 0.2 ml. saliva into melted beef agar.

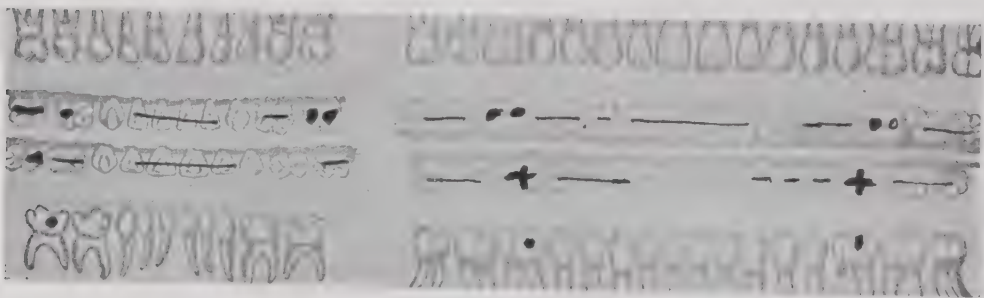
TABLE 302

Bobby  
113 months

TITRABLE ACIDITY AND ORGANIC ACID IN URINE  
*Values in milliequivalents per day*

Date	Titration acidity	pH	Total organic acid	Date	Titration acidity	pH	Total organic acid
9-18	12.9	6.81	35.2	10-16	15.6	6.56	32.9
9-19	21.6	6.07	36.6	10-17	18.2	6.72	34.8
9-20	29.2	5.60	39.6	10-18	16.8	6.80	34.0
9-21	12.0	6.70	30.0	10-19	20.6	6.30	32.8
9-22	30.4	5.80	34.8	10-20	16.0	6.70	36.4
9-23	24.8	5.70	36.5	10-21	15.6	6.68	42.2
9-24	8.1	6.72	24.0	10-22	12.6	6.62	35.6
9-25	29.2	6.13	30.5	10-23	15.0	6.59	36.6
9-26	20.8	6.10	36.2	10-24	16.4	6.57	36.7
9-27	25.2	5.85	33.5	10-25	16.0	6.63	37.8
9-28	23.8	5.94	32.7	10-26	5.0	6.87	46.5
9-29	14.1	6.50	36.4	10-27	10.0	6.77	37.6
9-30	21.4	6.12	32.3	10-28	14.8	6.58	33.0
10-1	20.6	6.28	28.4	10-29	17.2	6.42	30.2
10-2	12.4	6.64	32.4	10-30	17.7	6.28	33.0
10-3	17.4	6.40	31.2	10-31	16.4	6.47	33.8
10-4	—	—	—	11-1	11.9	6.67	37.4
10-5	10.7	6.83	29.8	11-2	18.4	6.32	38.8
10-6	26.0	6.39	43.0	11-3	17.9	6.20	33.1
10-7	20.2	6.29	34.4	11-4	18.5	6.37	30.2
10-8	12.8	6.61	35.1	11-5	10.1	6.67	37.2
10-9	10.3	5.42	28.6	11-6	21.4	5.29	20.4
10-10	28.5	6.09	38.1	11-7	15.1	6.49	30.3
10-11	20.2	6.40	35.9	11-8	18.0	6.20	28.6
10-12	18.6	7.21	29.6	11-9	10.4	6.52	33.6
10-13	18.0	7.00	33.5	11-10	6.2	6.96	30.8
10-14	19.2	6.42	33.3	11-11	15.7	6.40	31.3
10-15	13.3	6.82	29.9				

The age given is the initial age at start of study.



BOBBY

FIGURE 469. Dental examination, age 115 months.

TABLE 303

Bobby  
113 months

## IRON, COPPER, ZINC IN INTAKE, URINE, FECES\*

*Values are averages per day*

Date	IRON			COPPER			ZINC		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
9-18	9.23	0.13	9.19	4.30	0.79	2.02	13.85	1.71	13.14
9-23	9.75	0.06	9.41	3.84	0.29	2.12	15.72	0.42	12.99
9-28	11.66	0.05	8.56	5.30	0.46	2.28	15.38	0.38	11.65
10-3	10.38	0.11	6.83	4.49	0.51	2.02	15.47	1.50	9.20
10-8	15.71	0.08	10.66	4.52	0.39	2.22	14.26	0.46	11.50
10-13	10.42	0.04	8.28	4.43	0.31	1.92	16.27	0.31	10.50
10-18	12.07	0.07	8.36	5.86	0.38	1.88	14.88	0.44	11.56
10-23	13.67	0.06	8.58	6.21	0.55	2.18	16.34	0.50	15.08
10-28	12.51	0.03	8.17	5.02	0.31	2.00	15.37	0.41	12.99
11-2	9.54	0.07	8.02	5.00	0.40	2.37	17.44	0.49	13.11
11-7	7.81	0.08	8.66	4.71	0.33	1.87	14.29	0.48	11.70

The age given is the initial age at start of study. Dates given are first days of five-day balance periods.

\* Determined polarographically.

TABLE 304

Bobby  
113 months

## MANGANESE IN INTAKE, URINE, FECES

*Values are averages per day*

Date	Intake†	Urine*	Feces†	Date	Intake†	Urine*	Feces†
mo.-day	mg.	mg.	mg.	mo.-day	mg.	mg.	mg.
9-18	1.99	0.000	2.06	10-18	2.36	0.000	1.96
9-23	1.90	0.016	1.99	10-23	2.25	0.000	2.18
9-28	2.18	0.008	2.08	10-28	2.31	0.000	2.09
10-3	2.00	0.016	1.99				
10-8	2.22	0.023	2.29	11-2	2.01	0.000	2.06
10-13	2.13	0.000	2.20	11-7	2.11	0.004	1.95

The age given is the initial age at start of study. Dates given are first days of five-day balance periods.

\* Determined polarographically.

† Determined chemically.



TABLE 304A

Bobby  
113 months

## CARBON IN INTAKE, URINE, FECES

*Values in grams per day*

Date	Intake	Urine	Feces	Date	Intake	Urine	Feces
9-18	189.8	8.3	—	10-18	189.8	9.8	9.5
9-23	189.8	9.0	—	10-23	189.8	8.3	—
9-28	189.8	8.4	10.1	10-28	189.8	8.3	10.6
10-3	189.8	8.4	9.6				
10-8	189.8	8.2	—	11-2	189.8	8.2	—
10-13	189.8	8.8	—	11-7	189.8	7.9	13.5

TABLE 305

Bobby  
113 monthsIRON, MANGANESE, COPPER, ALUMINUM, LEAD, TIN  
IN INTAKE, FECES\**Values in milligrams per day*

Date	IRON		MANGANESE		COPPER	
	Intake	Feces	Intake	Feces	Intake	Feces
9-18	10.94	7.98	2.00	1.80	2.64	1.68
9-23	10.28	8.75	1.82	1.63	2.22	2.38
9-28	9.80	7.68	2.22	1.80	4.24	1.77
10-3	12.53	7.39	1.98	1.81	3.65	1.76
10-8	14.04	8.92	2.22	2.16	3.52	2.07
10-13	11.49	8.15	2.12	2.05	3.50	2.22
10-18	12.18	8.76	2.14	1.70	6.11	2.20
10-23	12.48	7.37	2.18	1.69	4.14	1.75
10-28	11.05	7.71	2.13	1.83	4.60	1.83
11-2	10.26	8.23	1.76	1.71	2.38	1.77
11-7	9.03	7.90	1.77	1.54	2.76	1.80

	ALUMINUM		LEAD		TIN	
	Intake	Feces	Intake	Feces	Intake	Feces
9-18	4.40	2.07	0.58	0.30	1.33	1.21
9-23	3.80	2.05	0.56	0.45	1.52	1.39
9-28	2.85	2.13	0.52	0.32	1.79	1.39
10-3	3.38	1.99	0.52	0.28	3.32	1.68
10-8	2.43	2.56	0.62	0.32	1.54	1.84
10-13	1.98	2.30	0.45	0.22	0.92	.87
10-18	3.50	2.40	0.67	0.25	0.77	.76
10-23	2.71	1.75	0.62	0.31	0.72	.74
10-28	3.02	1.77	0.52	0.26	0.70	.58
11-2	3.24	1.55	0.66	0.30	0.75	.64
11-7	2.14	1.84	0.52	0.30	0.76	.75

\* Determined spectrographically by the method of Brody, James K. and Ewing, D. T. Spectrographic determination of some metallic elements in food and feces. *Indus. Engin. Chem. (Anal. Ed.)* 17: 627, 1945.





BOBBY

FIGURE 470. Actual size reproduction of roentgenogram of left hand.  
Chronological age 113 months.



BOBBY

FIGURE 471. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 113 months.



BOBBY

FIGURE 472. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 113 months.



BOBBY

FIGURE 473. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 113 months.



BOBBY

FIGURE 474. Actual size reproduction of roentgenogram of left hip.  
Chronological age 113 months.





## BOBBY

FIGURE 475. Actual size reproduction of roentgenogram of left knee.  
Chronological age 113 months.



## BOBBY

FIGURE 476. Actual size reproduction of roentgenogram of left knee.  
Chronological age 113 months.



BOBBY

FIGURE 477. Actual size reproduction of roentgenogram of left foot.  
Chronological age 113 months.



**BOBBY**

**FIGURE 478.** Actual size reproduction of roentgenogram of left foot.  
Chronological age 113 months.



FIGURE 479. BOBBY, age 150 months.





BOBBY

FIGURE 480. Actual size reproduction of roentgenogram of left hand  
Chronological age 150 months.

## FRANK

Frank's father was Italian, a barber, about 35 years old. The mother was one of five siblings born in Scotland. She worked in the mills in Scotland before coming to Canada in 1928. Eighteen months later she brought her baby to Detroit.

### Medical History

Frank was born in a Canadian hospital March 25, 1929. He weighed 6 pounds, 8 ounces, delivery was normal and he was breast-fed for two months. He had whooping cough at three years and measles six months later. He was 64 months old when first examined by the Village pediatrician. The examination was negative except for an hemangioma of the left ankle. Schick, Dick, Pirquet and Wassermann tests were negative.

When Study II started Frank was 78 months old. His health was excellent throughout the eight months except for four days during which he had acute tonsillitis. November 11 he became ill and his temperature reached 102.4°. Evening temperature November 12 was 102.3°. On examination by the pediatrician November 13, entry read: "Acute tonsillitis. No cough or nasal discharge." Highest temperature on that day was 100° and the following day normal temperatures were recorded.

### Psychological

Frank first was tested when 42 months old. On the Stanford-Binet test he was given a M.A. of 38 months, I.Q. 91.

Subject was cooperative but a little self-centered and unwilling to do a great deal which displeased him. He seems to lack ability to use his usual impressions in finding his motor coordination. Except for his comprehension and retentive memory he seemed a little inferior. He appeared to show good comparative value and normal interest in self. His mental capacity in general would seem of low normal type.

Another examiner tested the boy when he was 80 months old. On the Stanford-Binet test he showed a M.A. of 70 months, I.Q. 88; on the Arthur Point Scale, M.A. 79 months, I.Q. 99; on the Goodenough test, M.A. 60 months.

Frank is an unusually attractive child with snapping black eyes, dark complexion and a square, plump face. He looks Italian. He was smiling and responsive and seemed to be delighted with the testing situation. He wanted to show the tests to Mrs. Powers, to Herbie and to everyone else that he could think of. He talked a great deal and had a high output of energy.

On the basis of the Stanford-Binet alone Frank's intelligence would be classified as dull normal, although with concrete material he works up to average. Frank is the kind of child who gives to everyone the impression of being much more intelligent than he is. He is alert, energetic, responsive and a bit small for his age. These all combine to make him seem younger than he is and more intelligent than he is. For these reasons his somewhat limited ability is likely to be overlooked at school and more will be expected of him than he will be able to handle.

A different examiner tested Frank three years later. At 115 months the Revised Stanford-Binet, Form L, showed a M.A. of 92 months, I.Q. 80.

Frank was very friendly and showed the sparkling nature which he had when examined three years ago. He appeared ready to cooperate in anything that might be requested of him. He did not have much to say spontaneously, but answered questions in a very friendly way. He talked about his bicycle and said that he likes to ride it. He said, that when he leaves the Village next week, he is going to a new boarding home in Detroit. He hopes he will like the new school. When asked what was hard at school Frank replied, "Nothing in this school," indicating that his program must be well adjusted to his abilities. He said that he likes reading best, although his reading is poor. When seen in the cottage, he showed a happy relationship with the other children and adults there. On a couple of occasions when he was teased by the other youngsters or was unable to keep up to them he would remark in an offhand way, "Oh well I don't care" or "So what?". This sort of thing did not seem to threaten him at all. This freedom in his nature appears to be a very healthy condition.

Frank cooperated well in the examination. He responded rather quickly when he was able to give answers and when he was sure he did not know the answer to a question he was not hesitant to say so. He made several incorrect replies, showing his lack of critical ability. He was able to concentrate his attention well for a short time but was not consistent in doing so.

Frank's rating on this Revised Stanford-Binet test places him in the dull normal group, in dealing with abstract verbal problems. His basal age was year 6 and successes ranged through year 11. He failed the comprehension questions at year 7 but passed those at year 8. Another irregular performance was that he failed the test for sentence memory at year 8 but passed the test of sentence

memory at year 11. The same instability is revealed as was shown at the time of the previous examination by his wider than average scatter. Although the rating on this test of verbal intelligence is a little lower than on the last previous test, the rating places him in the same grouping as far as intellectual level is concerned. It should be kept in mind also that Frank has middle-range average ability in dealing with concrete problems as shown by his work in the Arthur Point Scale.

### Endocrinological

Frank was 84 months old when classified by the endocrinologist from the medical history, growth records, basal metabolism, physical examination and roentgenograms of hip, shoulder, knee, foot and hand.

Gain of 3.2 inches in a period of one year, seven months. Normal increment for this age and time is 3.5 inches. None of his deciduous teeth has exfoliated. No structural endocrine abnormalities.

#### *Roentgenographic Study for Osseous Development*

Wrist: Distal epiphysis of the ulna, which normally appears at six, is barely visible. All the other centers including the carpal bones are present and normally developed.

Elbow: Internal condyle of the humerus, which normally appears at six, is present and normally developed. Proximal epiphysis of the radius, which normally appears at five, is present but definitely underdeveloped.

Diagnosis: Probable normal osseous development.

Classification: Endocrine normal.



TABLE 306

Frank

## RECUMBENT LENGTH AND WEIGHT

Age	RECUMBENT LENGTH		Weight	Age	RECUMBENT LENGTH		Weight
	Total	Stem			Total	Stem	
mo.-days	cm.	cm.	kg.	mo.-days	cm.	cm.	kg.
75-13	116.8	—	20.52	84-2	—	—	23.47
77-25	—	—	20.41	84-5	121.6	68.7	—
78-13	—	—	21.28	84-8	—	—	23.60
78-16	—	—	21.36	84-9	121.4	68.9	—
78-23	—	—	21.16	84-13	—	—	23.50
78-27	119.1	67.3	—	84-15	121.8	69.2	—
78-29	—	—	21.20	84-18	—	—	23.70
79-3	—	—	21.05	84-22	—	—	23.70
79-9	—	—	21.19	84-23	121.3	68.6	—
79-12	—	—	21.57	84-27	—	—	23.75
79-15	119.7	68.3	—	84-29	121.4	69.2	—
79-19	—	—	21.35	85-4	—	—	23.82
79-23	—	—	21.63	85-5	121.8	68.7	—
79-26	—	—	21.62	85-7	—	—	24.09
79-28	119.1	68.3	—	85-8	121.6	69.0	—
80-4	—	—	21.85	85-12	—	—	23.99
80-9	—	—	21.94	85-14	121.9	68.6	—
80-12	—	—	22.25	85-18	—	—	24.00
80-15	120.0	68.4	—	86-19	122.7	69.0	24.97
80-19	—	—	22.25	87-21	122.8	69.0	24.66
80-23	—	—	22.39	89-22	123.9	69.0	24.40
80-25	120.3	68.6	—	90-22	124.0	69.8	25.42
80-29	—	—	22.45	91-26	125.1	70.5	25.24
81-2	—	—	22.47	92-24	125.7	69.4	25.88
81-7	—	—	22.42	96-6	128.0	72.0	26.79
81-8	120.2	68.6	—	99-14	129.0	71.5	25.29
81-12	—	—	22.56	114-4	132.7	75.5	30.39
81-19	—	—	22.50	125-23	—	—	31.39
81-21	—	—	22.60	125-28	—	—	31.21
81-22	120.5	68.3	—	126-5	—	—	31.63
81-28	—	—	22.80	126-9	139.6	77.5	31.68
82-3	120.6	68.7	22.70	126-12	139.4	77.8	—
82-6	—	—	22.85	126-14	139.7	78.0	31.73
82-12	—	—	22.90	126-16	139.7	77.4	—
82-15	121.1	68.6	—	126-18	139.3	77.1	31.59
82-19	—	—	22.80	126-23	—	—	31.84
82-24	—	—	22.97	126-29	—	—	32.30
82-25	121.0	68.6	—	127-3	—	—	32.06
82-27	—	—	23.09	127-8	—	—	32.19
82-28	—	—	23.17	127-14	140.2	78.7	32.22
83-7	—	—	23.19	127-15	139.6	78.2	—
83-11	—	—	23.30	127-16	140.2	78.6	—
83-16	121.3	68.9	—	127-18	140.4	78.5	—
83-17	—	—	23.17	127-19	140.2	78.2	—
83-22	—	—	23.45	—	—	—	—
83-27	—	—	23.40	127-20	—	—	32.28
83-29	121.9	69.2	—	162-22	156.1	84.1	42.91

Actual values are averages of independent measurements by two workers. In calculating the smooth values given with the balance data the actual values given above were smoothed by three-point averaging and the resulting figures entered for their respective balance periods. Values for balance periods intervening between measurements were obtained by interpolation.



TABLE 307

Frank

## ANTHROPOMETRIC MEASUREMENTS

*Values in centimeters*

Age*	BREADTH			LENGTH		WIDTH	
	Biacro- mial	Intertro- chanteric	Inter- cristal	Tibia	Head	Chest	Head
79	21.8	20.2	19.2	23.8	19.1	19.0	14.2
80	22.3	20.0	19.0	24.1	20.0	18.7	14.3
81	22.2	21.0	19.3	23.5	19.2	19.0	14.4
83	22.0	21.0	19.5	23.8	19.2	18.7	14.4
83	22.3	21.0	19.6	24.2	19.2	18.5	14.3
84	22.0	21.0	19.5	24.1	19.1	19.3	14.5
86	22.6	21.4	19.0	24.5	19.3	19.8	14.5
87	23.0	21.5	20.0	24.1	19.2	19.2	14.3
88	23.7	21.3	19.5	24.5	19.3	18.8	14.5
90	23.8	21.1	19.4	24.8	19.3	19.6	14.4
91	23.9	21.4	19.5	24.7	19.2	19.0	14.5
92	23.6	21.3	19.5	25.5	19.2	19.5	14.5
93	24.0	21.7	20.0	25.3	19.2	19.0	14.5
96	23.0	22.0	20.0	25.8	19.2	19.5	14.4
99	24.4	21.8	20.0	26.0	19.5	20.2	14.4
114	24.3	—	21.0	27.8	19.5	21.0	14.8
126	25.0	—	21.5	29.0	19.6	21.6	14.8
127	26.0	—	21.6	29.6	19.5	21.0	14.5
128	26.1	—	21.7	29.7	19.5	21.0	14.8
163	34.1	26.8	25.0	40.7	19.4	23.5	15.0

Age*	DEPTH	CIRCUMFERENCES				
	Chest	Head	Chest	Thigh	Abdomen	Upper arm
79	14.0	53.1	56	32	57	16.0
80	14.0	54.0	57	33	53	16.0
81	14.0	54.0	57	34	56	17.0
83	13.6	53.3	57	34	52	17.0
83	13.7	53.5	57	34	54	17.4
84	14.3	53.2	58	36	56	18.0
86	14.3	54.5	56	35	54	18.0
87	14.5	54.6	58	35	54	17.5
88	14.5	54.5	57	34	55	17.4
90	14.0	53.6	59	33	54	16.4
91	14.0	54.0	58	34	56	17.0
92	14.5	54.5	59	35	54	17.0
93	14.5	54.0	59	36	54	17.5
96	14.2	54.0	61	36	55	18.0
99	14.6	54.0	61	34	56	16.2
114	15.8	54.5	65	38	62	17.8
126	16.0	55.0	65	39	61	18.6
127	15.5	54.5	64	39	60	18.6
128	15.5	55.0	64	40	59	19.0
163	16.1	56.1	72	—	68	20.3

\* Months.

## BLOOD DETERMINATIONS

Age	Date	Red cells	Hemo-globin	WHITE BLOOD CELLS				
				Total	Poly-morpho-nuclears	Lym-pho-cytes	Mono-cytes	Eosino-philés
months	mo.-day	millions	gm./100 cc.	per c. mm.	per cent	per cent	per cent	per cent
75	7-8	3.93	11†	5600	44	50	4	2
84	3-16	4.37	12†	6700	38	56	5	1
86	5-12	3.63	11†	6900	37	50	4	4
*86	5-12	4.15	11†	—	—	—	—	—
99	7-9	4.23	10†	6850	36	55	8	1
*126	9-13	4.58	13§	1800‡	56	36	8	0
Hematocrit				RED BLOOD CELL MEASUREMENTS				
				Volume	Weight	Diameter	Thickness	
per cent				c.μ	μμg.	μ	μ	
86	5-12	37	90	97	7.4	2.0		
126	9-13	40	87	—	7.5	2.0		
MINERALS (mg. per 100 ml.)								
SERUM					ERYTHROCYTES			
Calcium	Phosphorus	Sodium	Potassium	Chlorine	Sodium	Potassium	Chlorine	
78	9-20	9.5	5.65	338	16.5	393	42	452
86	5-12	10.0	4.96	310	14.4	364	63	436
126	9-13	11.4	6.65	324	32.1	370	45	378
PLASMA NITROGEN AND LIPID (mg. per 100 ml.)								
Nitrogen	Total lipid	Phospholipid	Neutral fat	CHOLESTEROL				
				Total	Free	Esters		
78	9-20	1158	—	—	—	—	—	—
86	5-12	1142	474	168	39	170	31	235
ERYTHROCYTE NITROGEN AND LIPID (mg. per 100 gm.)								
86	5-12	4916	457	259	16	154	114	67
78	9-20	Resistance Hypotonic sodium chloride	Hemolysis	Beginning, per cent of NaCl		0.38		
				Complete, per cent of NaCl		0.24		
		Saponin	Hemolysis	Beginning micrograms of saponin		10		
				Complete, micrograms of saponin		53		
86	5-12	Red blood cells total solids: 32.7 per cent by weight. Specific gravity: whole blood, 1.05; plasma, 1.02; red cells, 1.08.						

\* Venous blood.

† Haden-Hauser hemoglobinometer.

§ Evelyn photoelectric colorimeter.

‡ Heparin.

TABLE 309

Frank

BASAL METABOLISM MEASUREMENTS

Age	Date	Sur- face area*	Respi- ration	Pulse rate	Body temper- ature	Blood pres- sure	Basal metab- olism
months	mo.-day	sq.m.	per min.	per min.	°F	S/D†	Cal./24 hr.
78	10-8	0.839	22	—	—	—	1022
79	10-23	0.841	19	64	98.7	—	955
79	11-9	0.849	20	64	98.7	78/50	958
80	11-22	0.849	18	64	98.0	80/56	960
80	12-9	0.864	21	76	98.6	88/62	989
81	12-19	0.868	18	76	98.0	84/60	1042
81	1-2	0.868	22	72	98.2	88/60	962
82	1-15	0.873	18	78	98.6	90/66	1015
82	1-26	0.875	16	70	98.4	78/50	1010
83	2-17	0.881	16	65	98.4	78/50	1001
83	3-9	0.886	16	72	98.6	89/70	1056
84	3-22	0.893	18	72	97.8	86/60	1015
84	3-28	0.893	16	68	98.0	82/58	1037
84	4-1	0.892	16	60	98.0	84/59	970
84	4-7	0.895	17	68	98.0	82/60	998
85	4-15	0.894	18	81	99.0	87/64	1051
85	4-21	0.896	17	76	98.6	86/62	1015
85	4-27	0.900	18	81	99.2	90/62	1022
85	4-30	0.901	19	70	99.3	88/58	902
85	5-6	0.902	18	76	99.3	89/60	1018
126	9-21	1.10	26	62	98.1	80/42	1305
126	9-22	1.10	21	60	98.3	82/52	1311
127	10-31	1.12	22	78	98.4	84/48	1421
127	11-1	1.12	18	74	98.4	88/56	1356

\* DuBois formula.  
† Systolic/Diastolic.

TABLE 310

Frank

HEIGHT AND WEIGHT RECORD\*

Age	Height	Weight	Age	Height	Weight	Age	Height	Weight
months	inches	pounds	months	inches	pounds	months	inches	pounds
64	44	44 $\frac{1}{4}$	83	47 $\frac{1}{4}$	53 $\frac{1}{4}$	114	52 $\frac{1}{2}$	65 $\frac{1}{4}$
69	45	43 $\frac{1}{2}$	87	48 $\frac{1}{2}$	54 $\frac{3}{4}$	116	53	67 $\frac{1}{2}$
70	45	47 $\frac{3}{4}$	89	48 $\frac{3}{4}$	54	125	54 $\frac{1}{4}$	68 $\frac{1}{2}$
72	45 $\frac{3}{4}$	47 $\frac{3}{4}$	93	49 $\frac{1}{2}$	58 $\frac{1}{4}$	130	55 $\frac{3}{4}$	74
75	45 $\frac{3}{4}$	47 $\frac{3}{4}$	94	49 $\frac{1}{2}$	58 $\frac{3}{4}$	147	57 $\frac{1}{2}$	75 $\frac{1}{2}$
79	47	48 $\frac{3}{4}$	102	49 $\frac{1}{2}$	59 $\frac{1}{4}$	148	57 $\frac{1}{2}$	77 $\frac{1}{4}$
80	47	50	111	52 $\frac{1}{4}$	63 $\frac{3}{4}$			

\* Clinical. See also table of recumbent lengths and weights.

MEASUREMENTS OF THE BONES OF THE WRIST

AGE, months	75	78	84	86	99	126	163
CARPALS							
AREA, sq. mm.							
Hamate	88	90	96	97	118	161	232
Capitate	152	156	166	171	202	252	345
Lesser Multangular	17	22	28	28	42	73	129
Greater Multangular	37	38	40	44	62	92	154
Navicular	27	30	39	42	60	104	219
Lunate	42	48	51	53	65	100	167
Triangular	46	49	54	56	66	97	149
Pisiform							77
GREATEST DIAMETER, mm.							
Hamate	13	14	14	14	16	17	23
Capitate	17	17	17	18	20	22	26
Lesser Multangular	5	6	7	7	8	10	14
Greater Multangular	8	8	8	9	10	12	16
Navicular	7	8	9	9	12	15	22
Lunate	8	9	10	10	11	14	19
Triangular	9	10	10	10	12	14	17
Pisiform							11
Epiphyses							
1st Metacarpal	7	8	8	8	9	11	14
2nd Metacarpal	9	10	10	10	10	12	14
3rd Metacarpal	8	10	10	10	10	12	14
4th Metacarpal	7	8	8	8	8	10	12
ULNA							
DIAMETER, mm.							
Distal epiphysis	1	2	3	5	9	12	15
Distal metaphysis	12	12	12	12	13	14	16
RADIUS							
DIAMETER, mm.							
Distal epiphysis	19	20	21	21	23	25	32
WRIST AREA,* sq. mm.	1108	1128	1183	1170	1262	1469	1676

\* Measured with the planimeter using Flory's landmarks (Monographs of the Society for Research in Child Development, Vol. I, No. 3, 1936).

SKELETAL MATURATION  
*Values in months*

Chrono- logical age	HAND				FOOT	ELBOW	KNEE	HIP	SHOULDER	AVERAGE
	B.B.G.*	Flory†	Kelly‡	Todd§	Todd§	Todd§	Todd§	Todd§	Todd§	Todd§
75	91	75	88	82	78	75	81	80	83	80
78	94	76	94	85	81	81	84	85	87	84
84	95	79	94	89	86	84	89	89	88	88
86	98	81	100	91	88	88	90	93	92	90
99	112	92	112	105	103	102	105	101	103	103
126	128	108	122	129	133	121	—	129	125	127
163	177	147	160	165	—	—	—	—	—	—

\* Baldwin, B. T., Busby, L. M., Garside, H. V. Anatomic growth of children. University of Iowa Studies in Child Welfare, vol. 4, no. 1, 1928.  
† Flory, C. D. Osseous development in the hand as an index of skeletal development. Monographs of the Society for Research in Child Development, vol. 1, no. 3, 1936.  
‡ Kelly, H. J. Anatomic age and its relation to stature. University of Iowa Studies in Child Welfare, vol. 12, no. 5, 1937.  
§ Determined by T. Wingate Todd, C. C. Francis and Idell Pyle, Western Reserve University, Cleveland.





FRANK

FIGURE 481. Actual size reproduction of roentgenogram of left hand.  
Chronological age 75 months.





FRANK

FIGURE 482. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 75 months.



## FRANK

FIGURE 483. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 75 months.



FRANK

FIGURE 484. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 75 months.



FRANK

FIGURE 485. Actual size reproduction of roentgenogram of left hip.  
Chronological age 75 months.



FRANK

FIGURE 486. Actual size reproduction of roentgenogram of left knee.  
Chronological age 75 months.





FRANK

FIGURE 487. Actual size reproduction of roentgenogram of left knee.  
Chronological age 75 months.



FRANK

FIGURE 488. Actual size reproduction of roentgenogram of left foot.  
Chronological age 75 months.



FRANK

FIGURE 489. Actual size reproduction of roentgenogram of left foot.  
Chronological age 75 months.

TABLE 313

Frank  
78 monthsFOOD INTAKE  
*Values in grams per day*

Food	DATE							
	9-30	10-30	12-4	1-13	2-7	3-3	3-18	3-23
	to 10-30	to 12-4	to 1-13	to 2-7	to 3-3	to 3-18	to 3-23*	to 5-12†
Apple	100	100	100	100	100	100	100	100
Ascorbic acid	—	—	—	.02	.02	—	—	—
Banana	100	100	200	200	200	200	200	100
Beef, lean	100	100	100	100	100	100	100	100
Bread, white	20	70	70	70	70	70	70	70
Bread, whole wheat	30	30	30	30	30	30	30	30
Butter	20	30	30	30	36	35	38	48
Cabbage	25	25	25	25	25	25	25	25
Carrot	25	25	25	25	25	25	25	25
Cheese, American	15	15	15	15	15	15	15	15
Corn flakes	15	15	15	15	15	15	15	15
Egg, whole	50	50	50	50	50	50	50	50
Graham cracker	18	18	18	18	18	18	18	18
Lettuce	20	20	20	20	20	20	20	20
Milk, fluid	400	400†	400†	400†	400†	400†	400†	400†
Orange concentrate	50	50	50	50	—	—	—	—
Orange juice, fresh	—	—	—	—	—	50	50	50
Peanut butter	16	16	16	16	16	16	16	16
Potato	40	70	70	70	70	70	70	70
Salt	2	2	2	2	2	2	2	2
Shredded wheat	15	15	15	15	15	15	15	15
Spinach	—	—	—	—	—	100	—	—
Sugar (average)	9	6	5	6	8	11	12	10
Tomato juice	60	60	60	60	60	60	60	60
Water (average)	425	387	432	532	400	410	370	496

\* Oxalic acid, 0.7 gm., and calcium (as acetate) 0.058 gm., additional.

† Irradiated. Diluted 1:1.

‡ Paroidin, 2 cc. hypodermically, April 7, 9, 12, 14, 17, 19, 22, 24.

TABLE 314

Frank  
80 months

## PEDOMETER MEASUREMENTS

Date	Miles	Date	Miles	Date	Miles	Date	Miles	Date	Miles
11-16	1 $\frac{7}{16}$	12-14	1 $\frac{1}{16}$	1-11	1 $\frac{1}{2}$	3-8	1 $\frac{1}{8}$	4-18	1 $\frac{1}{8}$
11-17	1 $\frac{3}{16}$	12-15	1 $\frac{1}{16}$	1-12	1 $\frac{1}{4}$	3-14	2 $\frac{1}{8}$	4-19	2 $\frac{1}{4}$
11-23	1 $\frac{1}{2}$	12-21	2 $\frac{1}{8}$	1-18	1 $\frac{5}{8}$	3-22	2 $\frac{3}{4}$	4-25	1 $\frac{1}{8}$
11-24	$\frac{1}{8}$	12-22	1 $\frac{1}{8}$	1-19	2 $\frac{1}{4}$	3-29	2 $\frac{1}{4}$	4-26	2
				1-26	1 $\frac{3}{8}$				
11-30	1 $\frac{7}{16}$	12-28	1 $\frac{1}{16}$	2-1	1	4-4	2 $\frac{1}{4}$	5-2	1 $\frac{1}{2}$
12-1	1 $\frac{1}{4}$	12-29	1 $\frac{5}{8}$	2-29	1 $\frac{1}{4}$	4-5	$\frac{3}{4}$	5-3	1
12-7	1 $\frac{1}{16}$	1-4	1 $\frac{3}{4}$	3-1	2 $\frac{3}{4}$	4-11	1 $\frac{1}{2}$	5-9	2
12-8	1 $\frac{1}{16}$	1-5	1 $\frac{3}{8}$	3-7	2 $\frac{1}{2}$	4-12	1 $\frac{1}{8}$	5-10	1

New Haven pedometers were set at 27 inches and worn hooked to belt during hours awake.

## BODY LENGTH AND WEIGHT—INTAKE AND ELIMINATION

Date	Recumbent length*	Weight*	INTAKE			AVERAGE DAILY HEAT OF COMBUSTION			FECES				
			AVERAGE DAILY			In-take	Urine	Feces	AVERAGE DAILY			Lax-ation rate†	Elim-ination time‡
			Dry wt.‡	Total water†	Fat				Wet wt.	Dry wt.‡	Fat		
mo.-day	cm.	kg.	gm.	gm.	gm.	Cal.	Cal.	Cal.	gm.	gm.	gm.		hours
9-30	119	21.34	320	1330	57.5	1648	64	99	103.0	22.0	4.1	1.8	12
10-5	119	21.31	316	1237	57.5	1630	65	105	107.4	18.0	4.9	1.4	31
10-10	119	21.27	317	1269	57.5	1636	70	58	108.6	17.0	1.9	1.4	22
10-15	119	21.24	319	1249	57.5	1644	68	79	91.0	16.0	1.9	1.6	48
10-20	119	21.14	320	1139	57.5	1648	62	66	58.4	13.0	2.0	0.8	49
10-25	119	21.15	316	1209	57.5	1632	64	49	57.0	10.0	1.4	1.4	48
10-30	119	21.27	370	1249	71.0	1921	60	86	112.8	18.0	3.1	1.4	11
11-4	119	21.37	362	1162	71.0	1887	68	77	92.6	16.0	2.6	1.2	11
11-9	119	21.52	367	1260	71.0	1909	73	77	83.0	17.0	2.8	1.2	24
11-14	119	21.53	356	1250	71.0	1866	59	60	68.0	13.0	1.8	1.2	48
11-19	120	21.70	356	1241	71.0	1865	68	74	65.2	11.0	1.6	1.6	49
11-24	120	21.80	358	1291	71.0	1872	74	64	70.6	11.0	1.8	1.6	25
11-29	120	22.01	354	1269	71.0	1858	69	54	66.2	14.0	2.2	1.4	26
12-4	120	22.15	378	1323	74.0	1958	62	64	93.4	16.0	2.1	1.6	10
12-9	120	22.30	378	1351	74.0	1960	64	66	76.6	14.0	2.0	1.2	25
12-14	120	22.36	380	1348	74.0	1969	61	61	78.0	12.0	1.8	1.6	25
12-19	120	22.44	382	1376	74.0	1974	62	87	108.6	17.0	2.2	1.8	24
12-24	120	22.45	390	1384	74.0	2006	66	93	172.6	21.0	2.4	2.6	24
12-29	120	22.48	387	1376	74.0	1994	69	77	122.4	17.0	1.8	2.2	25
1-3	120	22.49	381	1416	74.0	1973	64	82	98.2	16.0	2.6	1.8	12
1-5	120	22.55	384	1369	74.0	1982	63	92	92.4	21.0	3.4	1.2	25
1-13	120	22.63	388	1550	74.0	1974	85	82	82.8	20.0	2.9	1.4	25
1-18	121	22.70	392	1434	74.0	1993	72	78	75.0	16.0	2.4	1.2	49
1-23	121	22.78	387	1487	74.0	1972	74	72	88.0	14.0	1.9	1.4	25
1-28	121	22.82	387	1460	74.0	1971	73	72	69.2	17.0	2.2	1.2	25
2-2	121	22.85	392	1380	74.0	1991	70	56	70.2	9.0	1.2	1.2	35
2-7	121	22.89	371	1297	80.0	1888	71	108	129.4	23.0	2.7	2.2	26
2-12	121	22.95	379	1285	80.0	1918	69	69	78.2	17.0	2.3	1.2	25
2-17	121	23.08	372	1286	80.0	1982	65	67	78.8	12.0	1.8	1.2	25
2-22	121	23.15	376	1354	80.0	1997	60	82	74.8	20.0	2.4	1.2	25
2-27	121	23.22	373	1291	80.0	1986	71	86	97.0	19.0	2.8	1.8	25
3-3	121	23.22	394	1394	82.1	1983	70	84	98.0	23.0	2.7	1.2	25
3-8	121	23.31	401	1470	82.1	2009	72	80	77.2	18.0	2.3	1.6	25
3-13	122	23.34	402	1455	82.1	2014	69	80	77.8	14.0	1.8	1.4	25
3-18	122	23.44	386	1318	82.6	1983	63	66	72.8	20.0	2.6	1.6	25
3-23	122	23.49	360	1371	92.5	1992	66	92	90.8	20.0	3.3	1.6	9
3-28	122	23.52	360	1325	92.5	1991	64	87	82.8	17.0	2.8	1.4	30
4-2	122	23.60	362	1224	92.5	1999	65	67	67.0	12.0	1.8	1.6	25
4-7	122	23.63	359	1231	92.5	1985	66	63	79.6	13.0	2.2	1.2	25
4-12	122	23.72	362	1272	92.5	2000	69	66	69.6	16.0	2.1	1.2	26
4-17	122	23.76	359	1306	92.5	1985	68	78	71.0	20.0	2.6	1.4	24
4-22	122	23.89	355	1321	92.5	1970	63	91	58.4	21.0	3.5	1.6	25
4-27	122	23.97	356	1461	92.5	1973	74	71	78.6	11.0	1.5	1.6	13
5-2	122	24.03	364	1441	92.5	2004	68	85	81.6	19.0	2.3	1.6	25
5-7	122	24.00	362	1821	92.5	1999	62	67	71.8	14.0	2.0	1.4	36

The age given is the initial age at start of study. Dates given are first days of five-day balance periods.  
\* See Table 306 for actual values and method of smoothing.

† Based on alcohol-dried food and oven-dried feces.

‡ Drinking water plus water in foods.

§ Average number of defecations per day.

¶ Elapsed time between ingestion and defecation of marker used to separate feces of five-day periods.



TABLE 316

Frank  
78 months

## NITROGEN AND NEGATIVE MINERALS IN INTAKE, URINE, FECES

*Values are averages per day*

Date	NITROGEN			PHOSPHORUS			CHLORINE			SULFUR		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
9-30	9.45	8.20	1.14	996	478	528	3031	2926	38	612	547	110
10-5	9.45	8.45	1.15	996	512	391	3031	2754	11	612	542	95
10-10	9.45	8.85	0.99	996	549	334	3031	2851	25	612	596	69
10-15	9.45	8.17	1.07	996	500	492	3031	2766	13	612	596	85
10-20	9.45	8.59	0.71	996	516	427	3031	2895	00	612	577	74
10-25	9.45	8.65	0.69	996	535	356	3031	2748	9	612	601	44
10-30	10.32	8.68	1.07	1076	494	456	3412	3138	37	692	593	76
11-4	10.32	9.44	0.67	1076	568	464	3412	3084	50	692	661	73
11-9	10.32	9.51	0.93	1076	383	451	3412	3540	75	692	662	74
11-14	10.32	9.67	0.77	1076	509	412	3412	3132	36	692	652	64
11-19	10.32	9.62	0.87	1076	468	459	3412	3454	20	692	622	67
11-24	10.32	9.31	0.89	1076	541	395	3412	2880	13	692	609	62
11-29	10.32	9.27	0.97	1076	513	373	3412	3661	13	692	604	65
12-4	10.43	8.65	1.18	1103	428	353	3524	3182	39	699	570	68
12-9	10.43	8.87	0.99	1103	521	368	3524	3158	36	699	560	45
12-14	10.43	8.99	0.91	1103	498	317	3524	3000	23	699	578	54
12-19	10.43	8.93	1.38	1103	536	439	3524	3354	41	699	594	87
12-24	10.43	8.66	1.39	1103	466	409	3524	3060	92	699	582	102
12-29	10.43	8.98	1.14	1103	488	350	3524	3300	66	699	565	79
1-3	10.43	9.09	1.03	1103	536	377	3524	3000	75	699	596	69
1-8	10.43	9.02	1.00	1103	494	478	3524	3300	47	699	580	86
1-13	10.43	8.95	0.95	1103	553	436	3524	3274	39	699	575	76
1-18	10.43	9.06	0.85	1103	525	410	3524	3312	52	699	599	84
1-23	10.43	9.28	0.98	1103	483	358	3524	3266	61	699	587	68
1-28	10.43	8.92	0.88	1103	594	422	3524	3507	116	699	616	68
2-2	10.43	9.04	0.82	1103	606	332	3524	3354	44	699	619	55
2-7	10.43	9.60	1.25	1100	688	544	3522	3198	95	697	646	116
2-12	10.43	8.90	1.08	1100	548	400	3522	3408	41	697	585	69
2-17	10.43	9.00	1.00	1100	556	348	3522	3150	25	697	621	63
2-22	10.43	8.59	1.04	1100	557	451	3522	3168	30	697	603	80
2-27	10.43	9.20	1.16	1100	587	446	3522	3195	47	697	627	93
3-3	10.79	9.49	1.08	1202	642	442	4067	3965	74	733	645	94
3-8	10.79	9.23	1.07	1202	621	414	4067	3794	76	733	632	91
3-13	10.79	9.76	1.08	1202	642	412	4067	3959	30	733	653	77
3-18	10.50	8.71	1.03	1115	594	453	3530	3320	47	705	602	75
3-23	10.39	9.19	1.08	1088	592	453	3418	3444	54	698	632	81
3-28	10.39	8.54	1.04	1088	577	457	3418	3168	60	698	587	74
4-2	10.39	8.46	0.86	1088	542	384	3418	3282	63	698	567	58
4-7	10.39	8.79	1.05	1088	562	345	3418	3510	56	698	578	58
4-12	10.39	9.01	0.97	1088	590	373	3418	3270	63	698	587	68
4-17	10.39	9.17	1.00	1088	689	449	3418	3114	73	698	592	75
4-22	10.39	8.44	0.94	1088	557	513	3418	3264	56	698	562	98
4-27	10.39	9.27	1.07	1088	612	404	3418	3168	48	698	596	81
5-2	10.39	8.64	1.06	1088	579	468	3418	3348	74	698	568	82
5-7	10.39	8.13	0.99	1088	597	353	3418	3006	76	698	546	64

TABLE 317

Frank  
78 months

## POSITIVE MINERALS IN INTAKE, URINE, FECES

*Values are averages per day*

Date	CALCIUM			MAGNESIUM			SODIUM			POTASSIUM		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
9-30	722	49	528	248	65	180	1876	1816	129	2252	1685	457
10-5	722	40	540	248	72	177	1876	1797	43	2252	1858	495
10-10	722	39	406	248	70	145	1876	1734	113	2252	1804	401
10-15	722	36	475	248	62	172	1876	1769	65	2252	1855	413
10-20	722	47	462	248	61	158	1876	1857	18	2252	1695	328
10-25	722	46	461	248	72	147	1876	1899	15	2252	1785	300
10-30	767	74	518	266	42	177	2176	1998	50	2440	1710	443
11-4	767	57	774	266	45	267	2176	1906	51	2440	1922	600
11-9	767	63	554	266	46	184	2176	2122	26	2440	1890	379
11-14	767	87	592	266	79	149	2176	1938	25	2440	1986	346
11-19	767	73	615	266	68	181	2176	2173	19	2440	2016	361
11-24	767	83	618	266	82	166	2176	2030	20	2440	2032	359
11-29	767	75	589	266	43	174	2176	2149	15	2440	1674	357
12-4	772	58	551	299	68	204	2180	2070	37	2822	2142	413
12-9	772	49	543	299	79	189	2180	2005	20	2822	2094	413
12-14	772	57	522	299	41	196	2180	1956	27	2822	2260	395
12-19	772	65	680	299	127	224	2180	2140	34	2822	2224	536
12-24	772	50	603	299	100	203	2180	1838	133	2822	2155	618
12-29	772	51	511	299	112	183	2180	2084	83	2822	2360	398
1-3	772	62	513	299	114	189	2180	1970	23	2822	2300	458
1-8	772	65	536	299	99	181	2180	2090	41	2822	2168	398
1-13	772	61	529	299	110	183	2180	2048	33	2822	2231	387
1-18	772	63	485	299	122	169	2180	2068	31	2822	2356	328
1-23	772	56	512	299	111	185	2180	2071	35	2822	2347	409
1-28	772	60	538	299	95	173	2180	2191	00	2822	2421	343
2-2	772	57	504	299	91	181	2180	2043	00	2822	2300	364
2-7	768	66	568	296	77	194	2178	2064	74	2786	2399	545
2-12	768	60	604	296	88	195	2178	2181	21	2786	2200	440
2-17	768	68	565	296	89	182	2178	1984	15	2786	2305	408
2-22	768	55	517	296	86	171	2178	2082	17	2786	2226	364
2-27	768	59	581	296	82	203	2178	2059	24	2786	2133	442
3-3	830	64	594	369	91	228	2549	2500	66	3167	2359	456
3-8	830	69	582	369	100	232	2549	2365	22	3167	2456	404
3-13	830	72	600	369	107	235	2549	2471	00	3167	2691	396
3-18	837	54	640	315	84	204	2172	2065	00	3058	2388	394
3-23	775	76	580	282	89	170	2169	2166	34	2676	2086	406
3-28	775	62	563	282	78	172	2169	1999	38	2676	1823	398
4-2	775	67	505	282	73	151	2169	2062	29	2676	1968	345
4-7	775	68	583	282	81	180	2169	2168	26	2676	2043	345
4-12	775	100	501	282	85	137	2169	2011	20	2676	2002	281
4-17	775	124	570	282	93	153	2169	1925	23	2676	2145	339
4-22	775	106	543	282	81	137	2169	1945	00	2676	1704	281
4-27	775	136	628	282	86	169	2169	1968	24	2676	2120	367
5-2	775	99	571	282	81	159	2169	2110	25	2676	1824	354
5-7	775	82	533	282	89	149	2169	1906	25	2676	1756	335

TABLE 318

Frank  
78 months

## COMPLEX CARBOHYDRATES IN INTAKE AND FECES

*Values in grams per day*

Date	LIGNIN		CELLULOSE		HEMICELLULOSE		
	Intake	Feces	Intake	Feces	INTAKE		Feces
					Total	Stable	
9-30	1.28	2.16	2.08	0.82	2.17	1.72	1.39
10-5	1.28	1.92	2.08	0.68	2.17	1.72	0.73
10-10	1.28	1.60	2.08	0.83	2.17	1.72	1.07
10-15	1.28	1.44	2.08	0.53	2.17	1.72	1.01
10-20	1.28	1.30	2.08	0.47	2.17	1.72	0.89
10-25	1.28	1.16	2.08	0.39	2.17	1.72	0.78
10-30	1.33	2.29	2.32	0.84	2.47	1.89	1.12
11-4	1.33	1.66	2.32	0.61	2.47	1.89	0.96
11-9	1.33	1.74	2.32	0.55	2.47	1.89	1.05
11-14	1.33	1.26	2.32	0.51	2.47	1.89	0.74
11-19	1.29	1.61	2.27	0.43	2.28	1.68	0.57
11-24	1.36	1.08	2.37	0.22	2.65	2.09	0.64
11-29	1.29	1.41	2.27	0.31	2.28	1.68	0.68
12-4	1.79	1.66	2.56	0.74	2.62	2.02	0.92
12-9	1.79	1.77	2.56	0.46	2.62	2.02	0.83
12-14	1.79	1.56	2.56	0.34	2.62	2.02	0.86
12-19	1.79	2.29	2.56	0.67	2.62	2.02	1.05
12-24	1.79	1.86	2.56	1.28	2.62	2.02	1.20
12-29	1.79	1.54	2.56	1.21	2.62	2.02	1.05
1-3	1.79	1.62	2.56	0.69	2.62	2.02	1.04
1-8	1.79	2.44	2.56	0.84	2.62	2.02	1.39
1-13	1.79	2.46	2.56	0.86	2.62	2.02	1.19
1-18	1.76	2.06	2.50	0.72	2.44	1.82	0.93
1-23	1.79	1.74	2.56	0.57	2.62	2.02	0.74
1-28	1.79	2.07	2.56	0.73	2.62	2.02	1.04
2-2	1.79	1.08	2.56	0.34	2.62	2.02	0.52
2-7	1.79	2.44	2.56	1.06	2.62	2.02	1.25
2-12	1.79	2.02	2.56	0.71	2.62	2.02	1.08
2-17	1.79	1.69	2.56	0.28	2.62	2.02	0.78
2-22	1.79	1.96	2.56	0.82	2.62	2.02	1.08
2-27	1.79	2.14	2.56	0.62	2.62	2.02	0.93
3-3	1.92	2.33	2.84	0.99	2.76	2.12	1.39
3-8	1.92	2.01	2.84	0.47	2.76	2.12	1.04
3-13	1.92	1.55	2.84	0.19	2.76	2.12	0.87
3-18	1.79	2.24	2.56	0.73	2.62	2.02	1.01
3-23	1.33	2.12	2.32	0.67	2.47	1.89	0.89
3-28	1.36	1.37	2.37	0.28	2.65	2.09	1.02
4-7	1.33	1.24	2.32	0.55	2.47	1.89	0.70
4-12	1.33	1.72	2.32	0.48	2.47	1.89	0.98
4-17	1.33	2.26	2.32	0.43	2.47	1.89	1.22
4-22	1.33	2.09	2.32	0.93	2.47	1.89	1.39
4-27	1.33	0.97	2.32	0.49	2.47	1.89	0.71
5-2	1.33	1.85	2.32	0.62	2.47	1.89	1.11
5-7	1.33	1.27	2.32	0.56	2.47	1.89	0.69

TABLE 319

Frank  
84 months

## NITROGEN PARTITION OF URINE

*Values in grams of nitrogen per day*

Date	Total nitrogen	Urea	Ammonia	Creatinine + Creatine	Creatinine	Uric acid
3-28	7.41	6.515	0.205	0.256	0.156	0.096
3-29	9.04	8.114	0.266	0.311	0.214	0.138
3-30	8.54	7.590	0.290	0.318	0.190	0.109
3-31	7.92	6.997	0.283	0.342	0.156	0.120
4-1	9.78	8.908	0.312	0.369	0.188	0.120
4-2	8.35	6.752	0.248	0.312	0.164	0.131
4-3	8.11	7.050	0.230	0.290	0.164	0.115
4-4	8.28	7.193	0.207	0.301	0.186	0.118
4-5	9.03	8.068	0.232	0.388	0.192	0.142
4-6	8.54	7.666	0.234	0.303	0.182	0.124
4-7	9.18	8.432	0.288	0.301	0.180	0.128
4-8	8.31	7.409	0.213	0.311	0.177	0.129
4-9	8.85	7.713	0.227	0.273	0.180	0.124
4-10	6.93	6.119	0.161	0.290	0.151	0.111
4-11	10.68	9.421	0.339	0.425	0.212	0.147
4-12	9.97	8.625	0.255	0.344	0.214	0.155
4-13	8.44	7.465	0.295	0.357	0.190	0.093
4-14	9.33	8.248	0.292	0.329	0.190	0.130
4-15	8.69	7.800	0.240	0.399	0.142	0.120
4-16	8.64	7.735	0.223	0.333	0.180	0.124
4-17	9.89	8.787	0.254	0.381	0.203	0.149
4-18	8.81	7.945	0.261	0.333	0.208	0.112
4-19	9.83	8.852	0.248	0.307	0.205	0.146
4-20	8.26	7.449	0.225	0.283	0.199	0.113
4-21	9.05	8.347	0.251	0.270	0.177	0.136
4-22	8.69	7.855	0.273	0.269	0.170	0.128
4-23	6.47	5.802	0.138	0.217	0.147	0.093
4-24	9.84	8.827	0.207	0.305	0.221	0.131
4-25	7.98	7.240	0.238	0.263	0.182	0.104
4-26	9.20	8.405	0.229	0.311	0.190	0.133
4-27	11.22	9.953	0.247	0.376	0.214	0.162
4-28	8.09	6.958	0.260	0.303	0.206	0.113
4-29	9.93	8.611	0.253	0.323	0.186	0.142
4-30	8.21	7.302	0.244	0.352	0.180	0.108
5-1	8.92	7.875	0.245	0.326	0.193	0.125
5-2	8.38	7.408	0.238	0.275	0.199	0.112
5-3	8.87	7.809	0.285	0.297	0.190	0.125
5-4	8.99	7.950	0.236	0.311	0.190	0.130
5-5	8.60	7.483	0.233	0.266	0.192	0.123
5-6	8.37	7.446	0.216	0.316	0.182	0.119
5-7	8.34	7.420	0.236	0.272	0.188	0.133
5-8	8.26	7.311	0.231	0.353	0.232	0.141
5-9	7.38	6.560	0.222	0.226	0.180	0.106
5-10	8.46	7.372	0.278	0.332	0.225	0.131
5-11	8.21	7.718	0.286	0.247	0.206	0.109

The age given is the initial age at start of study;



TABLE 320

Frank  
78 months

## IRON IN INTAKE, URINE AND FECES

*Values are averages per day*

Date	Intake	Urine	Feces	Date	Intake	Urine	Feces	Date	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mo.-day	mg.	mg.	mg.	mo.-day	mg.	mg.	mg.
9-30	7.39	0.43	26.40	12-14	8.50	0.24	6.09	2-27	8.46	0.16	7.96
10-5	7.39	0.17	26.64	12-19	8.50	0.20	9.92	3-3	9.48	0.12	11.79
10-10	7.39	0.47	11.60	12-24	8.50	0.18	11.39	3-8	9.48	0.57	10.22
10-15	7.39	0.22	9.54	12-29	8.50	0.40	6.59	3-13	9.48	0.95	6.48
10-20	7.39	0.17	9.25	1-3	8.50	0.00	6.02	3-18	8.50	0.10	9.12
10-25	7.39	0.54	6.58	1-8	8.50	0.24	19.74	3-23	8.20	0.12	14.45
10-30	8.20	0.25	29.92	1-13	8.50	0.34	10.25	3-28	8.20	0.12	12.96
11-4	8.20	0.22	11.68	1-18	8.50	0.26	12.84	4-2	8.20	0.24	6.92
11-9	8.20	0.18	10.39	1-23	8.50	0.15	7.60	4-7	8.20	0.10	8.32
11-14	8.20	0.01	6.42	1-28	8.50	0.12	10.46	4-12	8.20	0.18	7.40
11-19	8.20	1.51	7.42	2-2	8.50	0.22	3.23	4-17	8.20	0.22	10.38
11-24	8.20	0.21	9.31	2-7	8.46	0.24	8.80	4-22	8.20	0.18	31.37
11-29	8.20	0.17	5.60	2-12	8.46	0.24	7.76	4-27	8.20	0.16	5.29
12-4	8.50	0.18	10.80	2-17	8.46	0.18	5.14	5-2	8.20	0.22	8.86
12-9	8.50	0.47	10.59	2-22	8.46	0.01	7.25	5-7	8.20	0.25	6.48

The age given is the initial age at start of study. Dates given are first days of five-day balance periods

TABLE 321

Frank  
84 months

## TEMPERATURE AND PULSE

Date	Temper- ature	Pulse	Date	Temper- ature	Pulse	Date	Temper- ature	Pulse
4-7	98.0	68	4-19	98.6	76	5-2	98.4	72
4-8	98.2	68	4-20	98.2	74	5-3	98.2	84
4-9	98.2	76	4-21	98.6	76	5-4	98.2	76
4-10	98.2	80	4-22	98.2	74	5-5	98.6	76
4-11	98.7	88	4-23	98.4	68	5-6	99.3	76
4-12	98.2	81	4-24	98.2	72	5-7	98.2	80
4-13	98.2	80	4-25	98.2	72	5-8	98.2	78
4-14	98.2	80	4-26	98.4	72	5-9	98.2	76
4-15	99.0	80	4-27	99.2	80	5-10	98.4	76
4-16	98.2	73	4-28	98.6	72	5-11	98.6	76
4-17	98.6	72	4-29	98.2	68	5-12	98.0	76
4-18	99.0	68	4-30	99.3	70	5-13	98.6	72
			5-1	98.2	76			





FRANK

FIGURE 490. Actual size reproduction of roentgenogram of left hand.  
Chronological age 78 months.



FRANK

FIGURE 491. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 78 months.



FRANK

FIGURE 492. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 78 months.



FRANK

FIGURE 493. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 78 months.



FRANK

FIGURE 494. Actual size reproduction of roentgenogram of left hip.  
Chronological age 78 months.





FRANK

FIGURE 495. Actual size reproduction of roentgenogram of left knee.  
Chronological age 78 months.



FRANK

FIGURE 496. Actual size reproduction of roentgenogram of left knee.  
Chronological age 78 months.



FRANK

FIGURE 497. Actual size reproduction of roentgenogram of left foot.  
Chronological age 78 months.

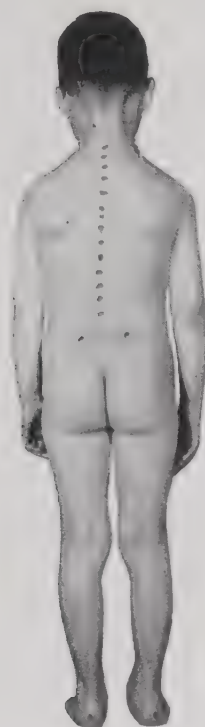
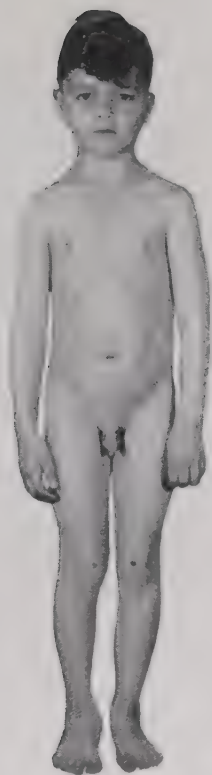


FRANK

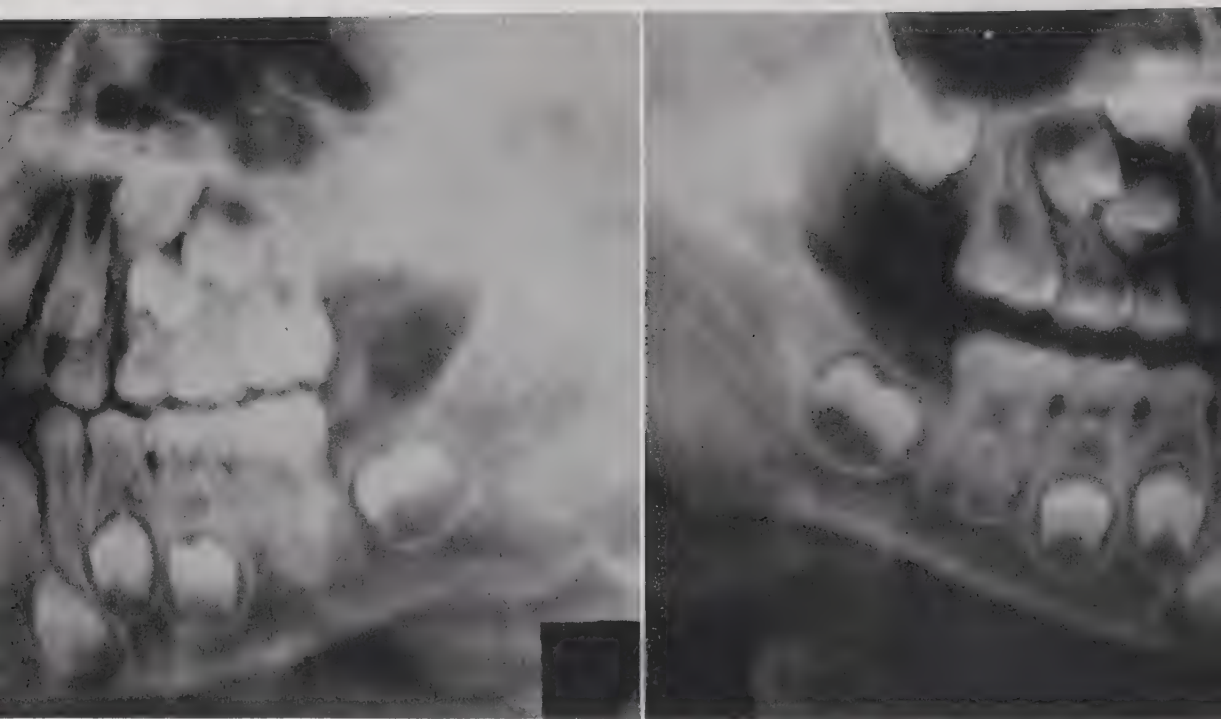
FIGURE 498. Actual size reproduction of roentgenogram of left foot.  
Chronological age 78 months.



FIGURE 499. FRANK  
Age 82 months







FRANK

FIGURE 500. Actual size reproduction of roentgenogram of jaws.  
Chronological age 86 months.



FRANK

FIGURE 501. Roentgenograms of teeth, age 81 months.



FRANK

FIGURE 502. Dental examination, age 80 months.



FRANK

FIGURE 503. Actual size reproduction of roentgenogram of left hand.  
Chronological age 84 months.



FRANK

FIGURE 504. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 84 months.



FRANK

FIGURE 505. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 84 months.





FRANK

FIGURE 506. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 84 months.



FRANK

FIGURE 507. Actual size reproduction of roentgenogram of left hip.  
Chronological age 84 months.



FRANK

FIGURE 508. Actual size reproduction of roentgenogram of left knee.  
Chronological age, 84 months.



FRANK

FIGURE 509. Actual size reproduction of roentgenogram of left knee.  
Chronological age 84 months.



FRANK

FIGURE 510. Actual size reproduction of roentgenogram of left foot.  
Chronological age 84 months.





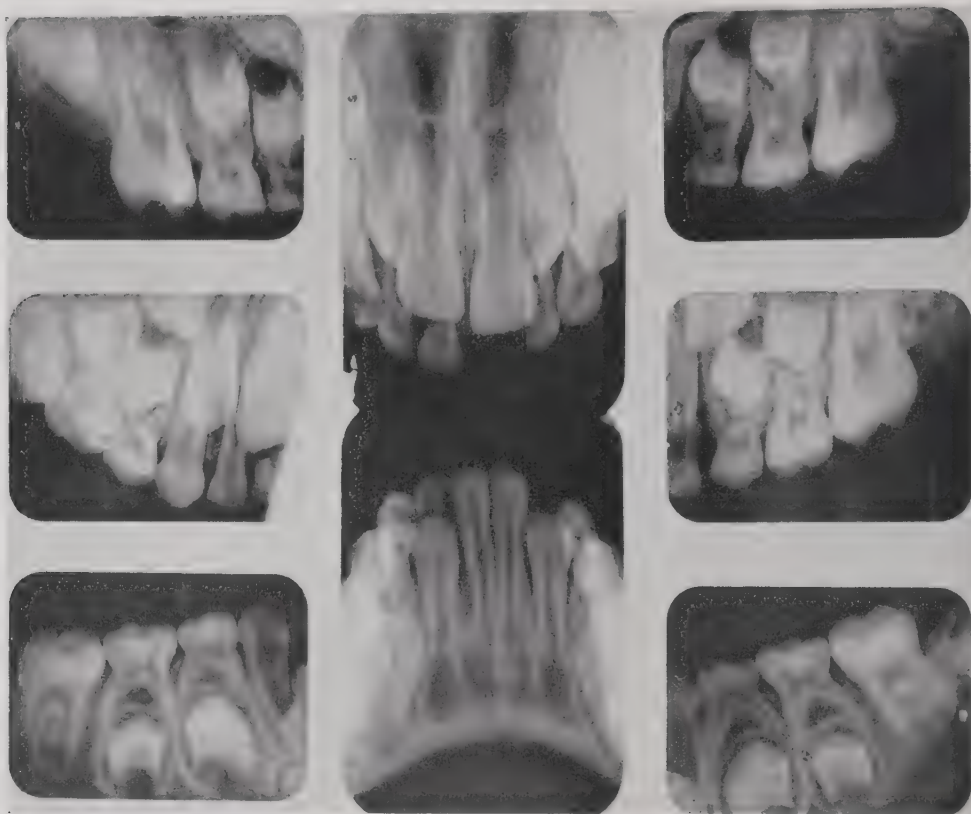
FRANK

FIGURE 511. Actual size reproduction of roentgenogram of left foot.  
Chronological age 84 months.



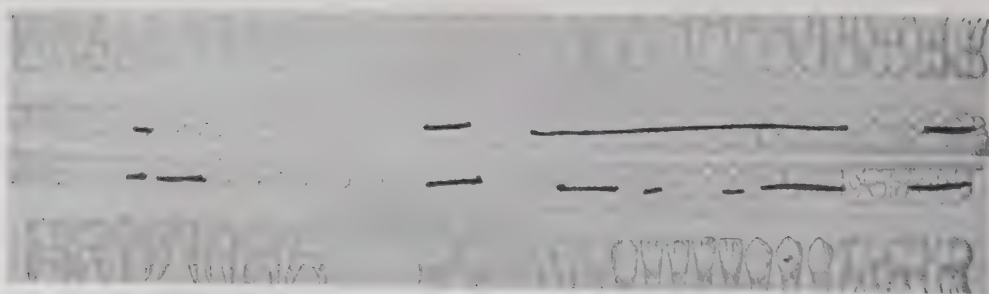
## FRANK

FIGURE 512. Actual size reproduction of roentgenogram of jaws.  
Chronological age 81 months.



FRANK

FIGURE 513. Roentgenograms of teeth, age 86 months.



FRANK

FIGURE 514. Dental examination, age 86 months.



FRANK

FIGURE 515. Actual size reproduction of roentgenogram of left hand.  
Chronological age 86 months.



FRANK

FIGURE 516. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 86 months.





FRANK

FIGURE 517. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 85 months.



FRANK

FIGURE 518. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 86 months.



FRANK

FIGURE 519. Actual size reproduction of roentgenogram of left hip.  
Chronological age 86 months.



## FRANK

FIGURE 520. Actual size reproduction of roentgenogram of left knee.  
Chronological age 86 months.



## FRANK

FIGURE 521. Actual size reproduction of roentgenogram of left knee.  
Chronological age 86 months.





FRANK

FIGURE 522. Actual size reproduction of roentgenogram of left foot.  
Chronological age 86 months.



FRANK

FIGURE 523. Actual size reproduction of roentgenogram of left foot.  
Chronological age 86 months.

## ROENTGENOGRAMS OF PROGRESS OF B

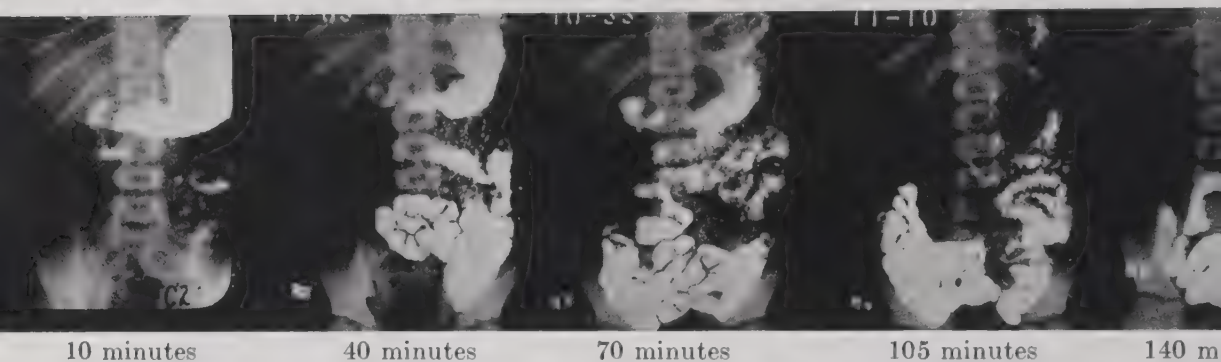


FIGURE 524. Progress of meal consisting of 2 ounces of barium sulfate and 4 ounces of water. The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

FRANK  
Age, 94 months

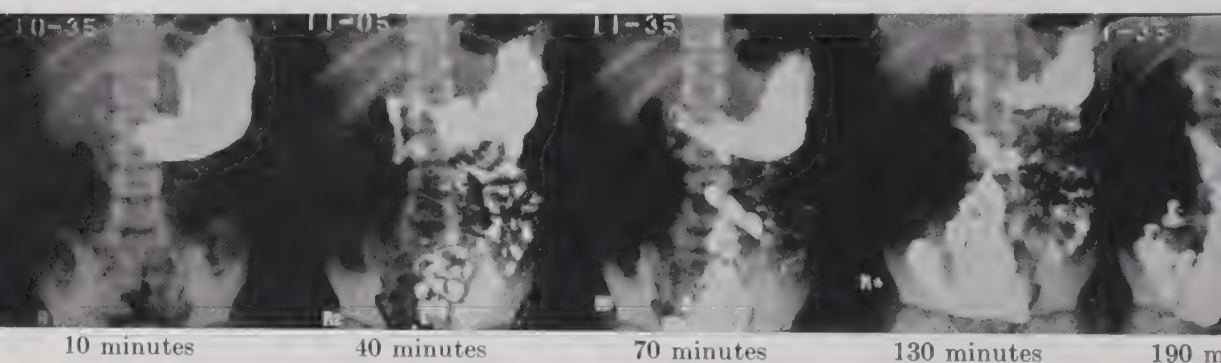


FIGURE 525. Progress of meal consisting of 2 ounces of barium sulfate and 4 ounces standard pasteurized milk (3.5 per cent fat). The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

FRANK  
Age, 94 months

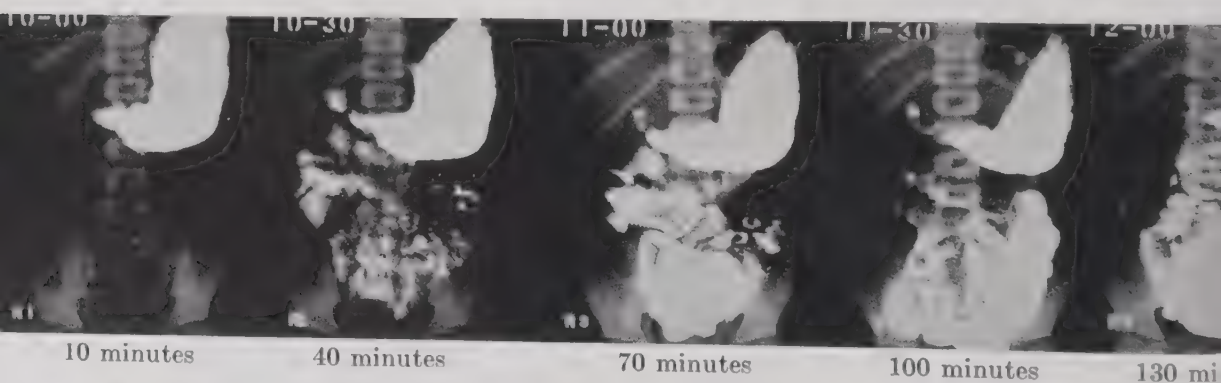
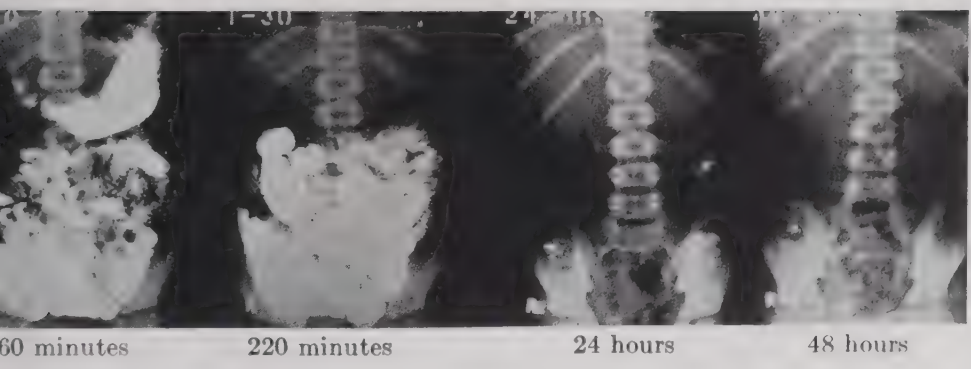
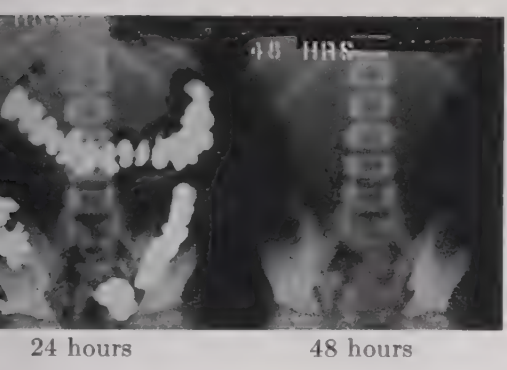
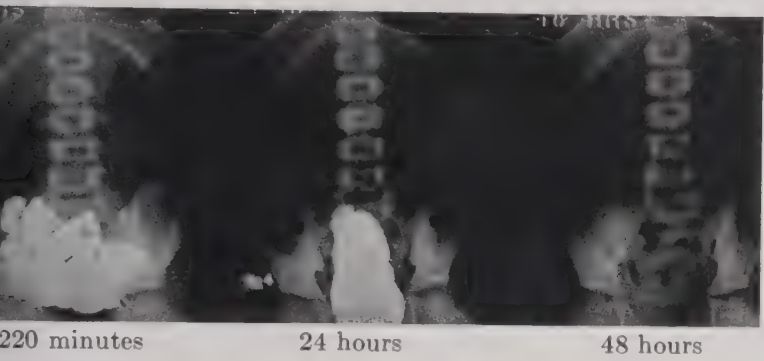


FIGURE 526. Progress of meal consisting of 2 ounces of barium sulfate, 3 ounces of water and 1 ounce of corn syrup (approximately 30 per cent glucose, 61 per cent carbohydrate). The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

FRANK  
Age, 94 months

ALS THROUGH GASTROINTESTINAL TRACT





## ROENTGENOGRAMS OF PROGRESS OF BARIUM MEAL

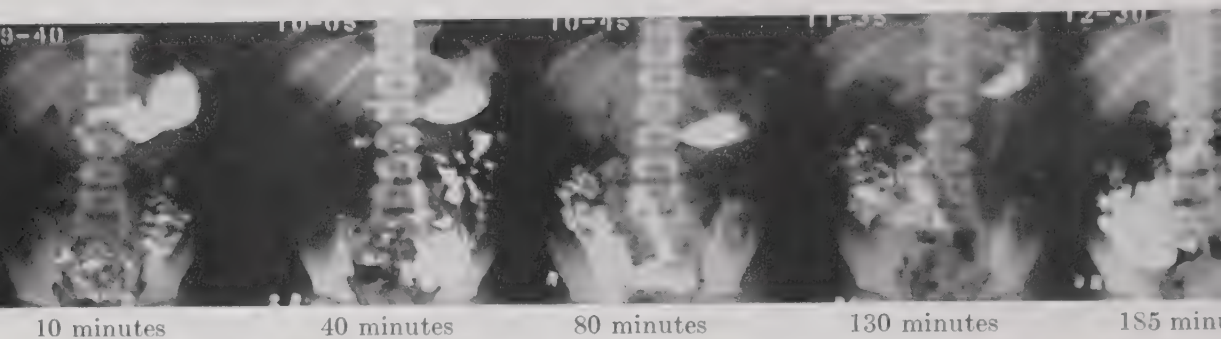


FIGURE 527. Progress of meal consisting of 40 grams of barium sulfate mixed with 100 grams of raw, ground lean meat, baked twenty to thirty minutes and ingested with 200 ml. of water. In the 290 gm. of barium, meat and water ingested (about 50 gm. of water were lost in cooking) the concentrations of fat and protein were approximately 3.5 and 7 per cent, respectively.

FRANK

Age, 94 months

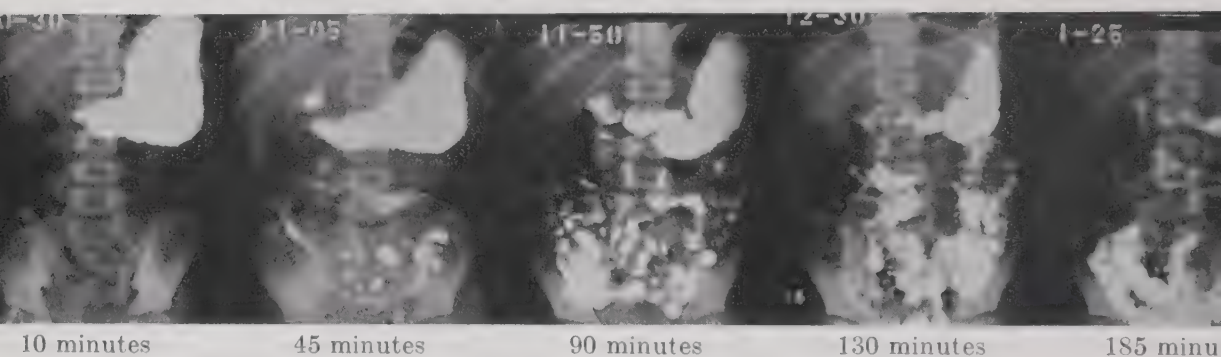


FIGURE 528. Progress of meal consisting of 2 ounces of barium sulfate and 4 ounces of cream (20 per cent fat). The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

FRANK

Age, 94 months

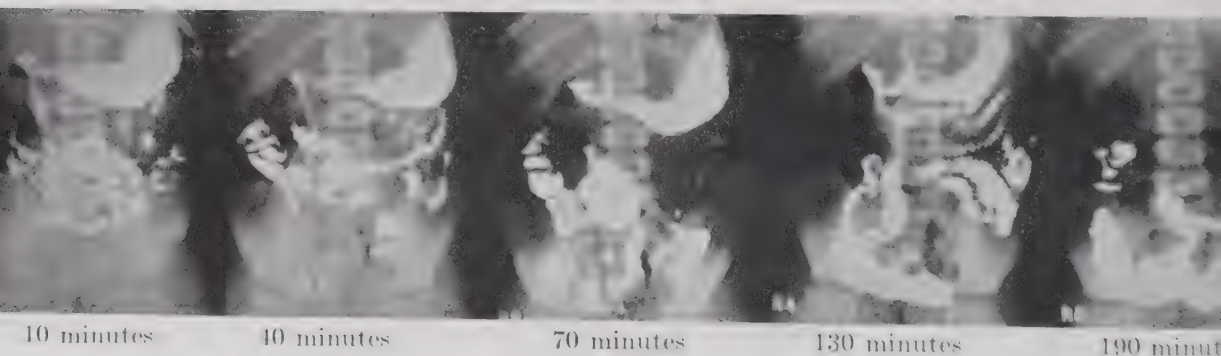


FIGURE 529. Progress of meal consisting of 2 ounces of barium sulfate, 4 ounces of standard pasteurized milk and 0.2-0.3 gm. carmine. The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

FRANK

Age, 114 months

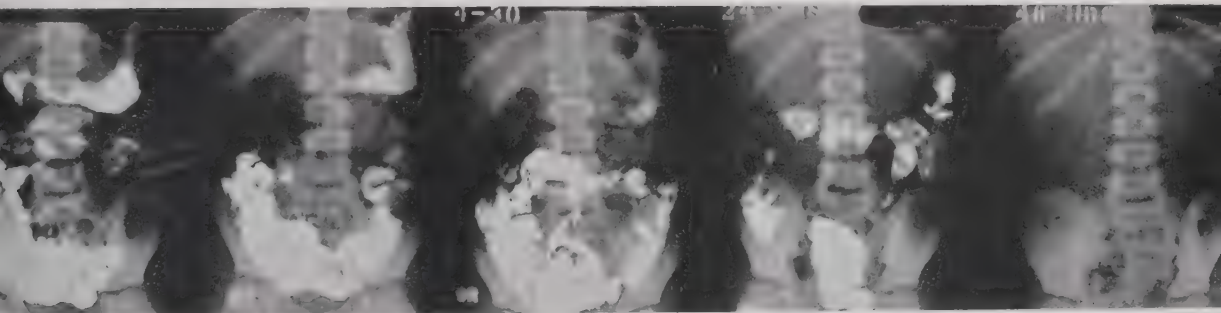


ALS THROUGH GASTROINTESTINAL TRACT



4 hours

48 hours



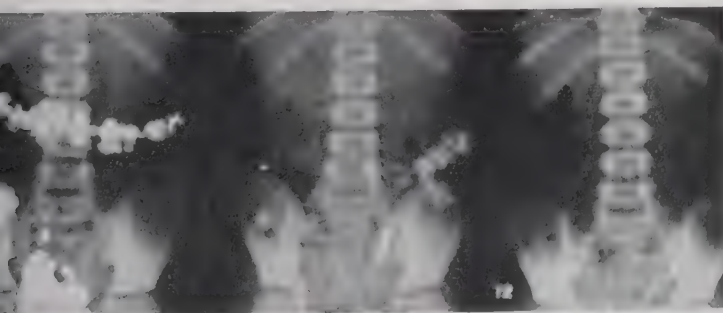
245 minutes

275 minutes

370 minutes

24 hours

48 hours



24 hours

48 hours

72 hours

## ROENTGENOGRAMS OF PROGRESS OF BA

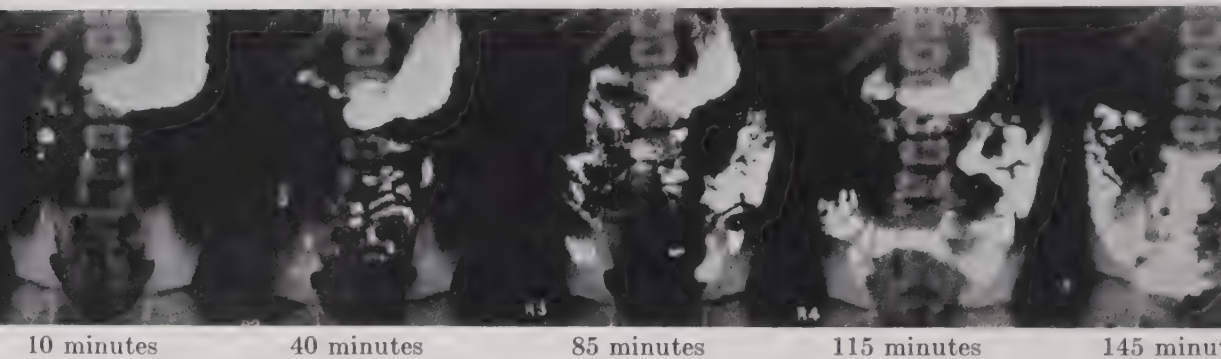


FIGURE 530. Progress of meal consisting of 2 ounces of barium sulfate and 4 ounces of standard pasteurized milk (3.5 per cent fat). The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

FRANK  
Age, 114 months

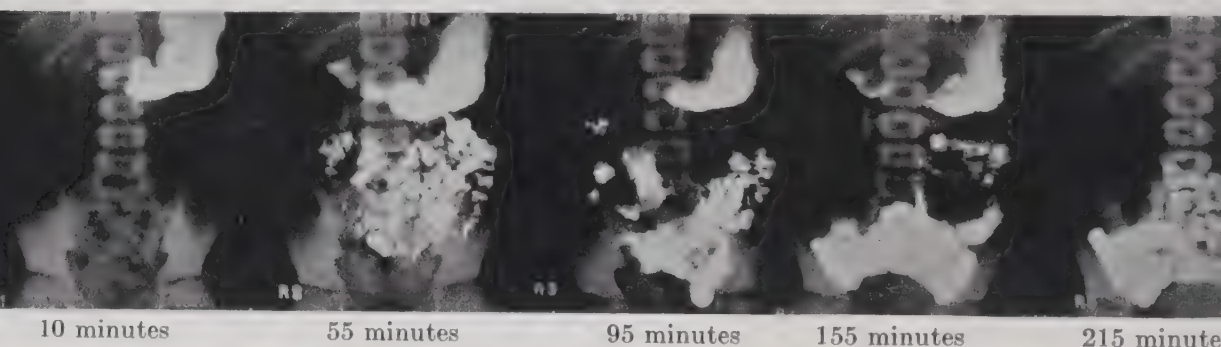


FIGURE 531. Progress of meal consisting of 2 ounces of barium sulfate and 4 ounces of evaporated milk, diluted 1:1 with water. The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

FRANK  
Age, 114 months

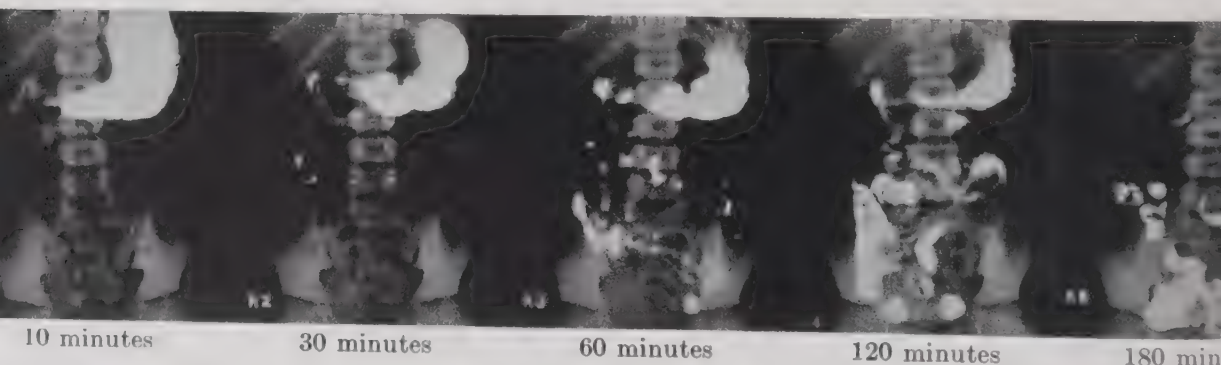
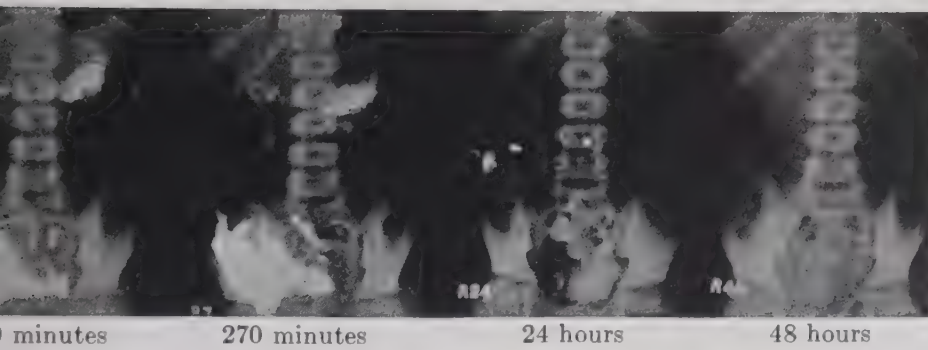
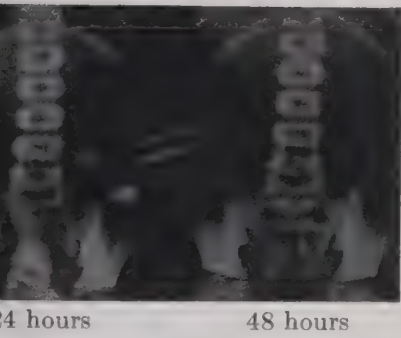
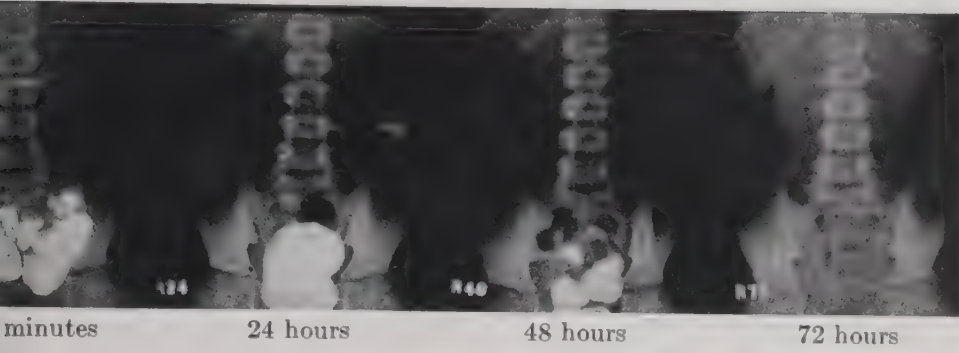


FIGURE 532. Progress of meal consisting of 2 ounces of barium sulfate and 4 ounces of base-exchanged milk. The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

FRANK  
Age, 114 months

LS THROUGH GASTROINTESTINAL TRACT





FRANK

FIGURE 533. Actual size reproduction of roentgenogram of left hand.  
Chronological age 99 months.





FRANK

FIGURE 534. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 99 months.





FRANK

FIGURE 535. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 99 months.



## FRANK

FIGURE 536. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 99 months.



FRANK

FIGURE 537. Actual size reproduction of roentgenogram of left hip.  
Chronological age 99 months.



FRANK

FIGURE 538. Actual size reproduction of roentgenogram of left knee.  
Chronological age, 99 months.



FRANK

FIGURE 539. Actual size reproduction of roentgenogram of left knee.  
Chronological age 99 months.





FRANK

FIGURE 540. Actual size reproduction of roentgenogram of left foot.  
Chronological age 99 months.



FRANK

FIGURE 541. Actual size reproduction of roentgenogram of left foot.  
Chronological age 99 months.



FIGURE 542. FRANK, age 114 months.

TABLE 322

Frank  
126 months

## SALIVA CULTURE ESTIMATION OF CARIES ACTIVITY

Date	QUANTITATIVE*			QUALITATIVE†	COLOR REACTION TEST‡			
	Lacto- bacilli	Cocci	Yeast		hours after preparation			
					24	48	72	96
mo.-day	colonies per ml. of saliva							
9-22	57,600	0	0	+	1	3	4	4
10-23	14,400	0	10	+	2	4	4	4
10-31	1,100	0	0	+	0	3	4	4
11-7	700	850	0	+	0	4	4	4
11-14	21,600	750	40	+	0	4	4	4

\* 0.2 ml. saliva to tomato agar plate.

† 1.0 ml. saliva in acid glucose broth.

‡ 0.2 ml. saliva into melted beef agar.

TABLE 323

Frank  
126 months

FOOD INTAKE  
*Values in grams per day*

Food	DATE	Food	DATE	Food	DATE
	9-18 to 11-12		9-18 to 11-12		9-18 to 11-12
Apple	100	Cheese, American	20	Orange juice,	
Banana	150	Corn flakes	30	canned	100
Beef, lean	100	Egg, whole	100	Peanut butter	16
Bread, white	50	Gelatin	3	Peas, quick frozen	25
Bread,		Graham cracker	36	Potato	120
whole wheat	50	Honey	15	Salt	2
Butter	60	Lettuce	25	Sugar (average)	20
Cabbage	25	Milk, fluid,		Tomato juice	60
Carrot	50	irradiated	500	Water (average)	498

TABLE 324

Frank  
126 months

BODY LENGTH AND WEIGHT—INTAKE AND ELIMINATION

Date	Recum- bent length*	Weight*	INTAKE			AVERAGE DAILY HEAT OF COMBUSTION			FECES				
			AVERAGE DAILY						AVERAGE DAILY			Lax- ation rate†	Elim- ination time‡
			Dry wt.*	Total water†	Fat	In- take	Urine	Feces	Wet wt.	Dry wt.*	Fat		
mo.-day	cm.	kg.	gm.	gm.	gm.	Cal.	Cal.	Cal.	gm.	gm.	gm.		hours
9-18	139	31.39	446	1867	108.6	2379	89	122	100.4	24.4	5.1	1.2	26
9-23	139	31.21	446	1681	110.6	2391	88	68	52.4	14.0	2.7	1.8	26
9-28	139	31.63	482	1686	118.2	2572	88	101	76.6	20.7	3.9	1.0	50
10-3	140	31.68	453	1652	113.4	2420	94	88	60.8	17.9	3.4	1.4	73
10-8	140	31.73	466	1801	114.2	2475	82	114	94.2	23.4	4.0	1.2	30
10-13	140	31.59	456	1618	113.0	2443	91	87	66.4	18.1	3.1	1.2	36
10-18	140	31.84	516	1603	114.3	2686	95	103	79.6	21.0	3.6	1.0	36
10-23	140	32.30	503	1638	113.1	2633	97	97	79.0	20.5	3.5	1.2	37
10-28	140	32.06	471	1656	110.5	2471	94	115	100.2	23.9	4.1	1.0	26
11-2	140	32.19	450	1675	112.8	2429	88	102	85.0	21.1	3.7	1.4	11
11-7	140	32.22	469	1663	112.2	2487	93	112	96.0	24.0	3.7	1.0	30

The age given is the initial age at start of study. Dates given are first days of five-day balance periods.  
\* See Table 306 for actual values and method of smoothing.  
† Based on vacuum-dried food and cryochem-dried feces. Corresponding values for alcohol-dried food and oven-dried feces are given in Table 597, page 1421.  
‡ Drinking water plus water in foods.  
§ Average number of defecations per day.  
§ Elapsed time between ingestion and defecation of marker used to separate feces of five-day periods

TABLE 325

Frank  
126 months

## POSITIVE MINERALS IN INTAKE, URINE, FECES

*Values are averages per day*

Date	CALCIUM			MAGNESIUM			SODIUM			POTASSIUM		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
9-18	933	104	518	297	117	182	3048	2766	34	3491	2762	490
9-23	966	152	501	312	102	128	2982	2714	6	3405	2759	235
9-28	919	91	738	290	119	182	3069	2619	11	3411	2837	364
10-3	949	103	465	318	58	118	3059	2676	9	3487	2662	281
10-8	912	115	676	295	73	178	2966	2643	20	3487	2605	410
10-13	945	108	495	318	124	128	3068	2734	11	3503	2749	276
10-18	938	104	666	307	113	175	3018	2658	13	3501	3000	353
10-23	949	120	623	306	92	179	2990	2745	13	3528	3050	347
10-28	937	114	640	294	114	188	3024	2646	48	3465	3026	450
11-2	966	113	651	297	118	170	2996	2706	23	3512	2956	403
11-7	1000	112	630	309	117	159	2925	2841	17	3567	2864	323

TABLE 326

Frank  
126 months

## NITROGEN AND NEGATIVE MINERALS IN INTAKE, URINE, FECES

*Values are averages per day*

Date	NITROGEN			PHOSPHORUS			CHLORINE			SULFUR		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
9-18	12.90	10.38	1.26	1474	736	566	4423	4282	32	1010	722	133
9-23	12.68	10.78	0.81	1492	795	406	4345	4079	14	959	764	77
9-28	13.26	10.74	1.19	1469	836	552	4396	4075	24	1037	743	111
10-3	13.75	11.01	1.00	1525	756	460	4332	4135	13	991	756	102
10-8	13.07	10.64	1.28	1466	825	539	4161	3952	29	1058	754	124
10-13	13.39	11.21	0.99	1529	852	397	4290	4231	17	894	757	99
10-18	13.26	11.24	1.19	1529	834	524	4491	3993	24	1032	766	115
10-23	13.66	11.50	1.10	1531	835	494	4434	4300	14	1084	818	111
10-28	13.35	11.21	1.24	1450	836	566	4295	3958	37	950	798	127
11-2	13.47	11.17	1.13	1487	856	496	4446	4162	26	970	784	114
11-7	13.21	11.16	1.21	1559	846	460	4335	4270	33	1009	767	129



## NITROGEN PARTITION OF URINE

*Values in grams of nitrogen per day*

Date	Urine volume	Total nitrogen	Urea	Ammonia	Creatinine + Creatine	Creatinine	Uric acid
9-18	630	10.014	8.241	0.309	0.316	0.234	0.135
9-19	1060	10.735	9.023	0.371	0.346	0.255	0.118
9-20	1265	10.176	8.765	0.340	0.357	0.265	0.114
9-21	1345	10.512	9.022	0.290	0.342	0.263	0.179
9-22	735	10.396	8.957	0.303	0.318	0.246	0.149
9-23	704	8.084	7.049	0.181	0.324	0.182	0.149
9-24	1045	14.349	11.947	0.468	0.463	0.310	0.194
9-25	700	10.038	7.498	0.282	0.342	0.222	0.156
9-26	695	8.360	6.932	0.188	0.327	0.205	0.143
9-27	950	13.099	11.536	0.404	0.386	0.297	0.179
9-28	510	7.468	6.545	0.225	0.262	0.165	0.144
9-29	1295	14.793	12.372	0.468	0.444	0.346	0.179
9-30	1075	10.618	8.418	0.304	0.379	0.252	0.133
10-1	865	9.955	8.609	0.290	0.326	0.232	0.117
10-2	720	10.690	9.007	0.313	0.386	0.248	0.128
10-3	805	10.745	9.234	0.402	0.392	0.234	0.130
10-4	785	11.382	9.758	0.538	0.417	0.246	0.135
10-5	785	10.158	8.772	0.438	0.336	0.211	0.128
10-6	925	11.836	10.153	0.455	0.393	0.268	0.135
10-7	1240	11.000	9.542	0.448	0.344	0.264	0.125
10-8	518	9.738	8.293	0.387	0.340	0.244	0.131
10-9	722	11.446	9.688	0.722	0.346	0.250	0.131
10-10	1280	11.203	9.629	0.483	0.366	0.251	0.154
10-11	1310	11.219	9.600	0.544	0.395	0.264	0.141
10-12	1095	9.772	8.509	0.367	0.340	0.222	0.127
10-13	930	12.332	10.968	0.355	0.383	0.271	0.130
10-14	795	10.967	9.697	0.324	0.338	0.231	0.133
10-15	745	10.534	8.954	0.306	0.312	0.229	0.134
10-16	1095	11.161	9.467	0.417	0.327	0.260	0.119
10-17	975	10.943	9.366	0.436	0.295	0.236	0.138
10-18	945	10.995	9.621	0.402	0.334	0.236	0.139
10-19	780	12.026	10.623	0.397	0.370	0.246	0.131
10-20	875	11.227	9.577	0.345	0.368	0.250	0.141
10-21	955	10.584	9.190	0.362	0.359	0.245	0.135
10-22	990	11.427	9.148	0.303	0.389	0.271	0.149
10-23	815	11.524	9.902	0.358	0.361	0.269	0.138
10-24	1090	11.536	10.140	0.312	0.363	0.274	0.137
10-25	1143	11.276	9.774	0.418	0.336	0.243	0.151
10-26	985	11.472	9.818	0.478	0.374	0.251	0.143
10-27	1040	11.669	10.209	0.347	0.383	0.254	0.145
10-28	1045	12.000	10.389	0.401	0.391	0.237	0.140
10-29	728	10.933	9.568	0.362	0.334	0.261	0.134
10-30	995	10.502	8.770	0.518	0.277	0.246	0.148
10-31	780	10.934	9.516	0.344	0.348	0.276	0.131
11-1	1165	11.945	10.272	0.368	0.366	0.267	0.146
11-2	1273	11.520	9.838	0.498	0.361	0.249	0.146
11-3	710	11.508	9.834	0.366	0.392	0.304	0.142
11-4	1170	11.346	9.768	0.312	0.375	0.271	0.138
11-5	960	11.117	9.492	0.288	0.388	0.277	0.143
11-6	985	11.066	9.041	0.307	0.364	0.254	0.146
11-7	1355	10.970	9.725	0.291	0.317	0.254	0.148
11-8	920	10.939	9.090	0.318	0.413	0.263	0.135
11-9	609	10.668	9.406	0.274	0.356	0.272	0.135
11-10	1195	11.561	10.201	0.313	0.367	0.267	0.144
11-11	880	11.323	9.965	0.295	0.361	0.282	0.148

The age given is the initial age at start of study. Urine volumes are in milliliters.

TABLE 328

Frank  
126 months

COMPLEX CARBOHYDRATES IN INTAKE AND FECES  
*Values in grams per day*

Date	LIGNIN		CELLULOSE		HEMICELLULOSE		
	Intake	Feces	Intake	Feces	INTAKE		Feces
					Total	Stable	
9-18	1.26	1.39	2.88	0.79	2.87	1.65	0.65
9-23	1.26	1.02	2.88	0.51	2.87	1.65	0.54
9-28	1.26	1.31	2.88	0.63	2.87	1.65	0.64
10-3	1.26	1.34	2.88	0.46	2.87	1.65	0.69
10-8	1.26	1.33	2.88	0.90	2.87	1.65	0.58
10-13	1.26	1.32	2.88	0.41	2.87	1.65	0.53
10-18	1.26	1.44	2.88	0.70	2.87	1.65	0.64
10-23	1.26	1.30	2.88	0.68	2.87	1.65	0.69
10-28	1.26	1.76	2.88	0.80	2.87	1.65	0.71
11-2	1.26	1.28	2.88	0.76	2.87	1.65	0.68
11-7	1.26	1.69	2.88	0.73	2.87	1.65	0.68

TABLE 329

Frank  
126 months

FAT PARTITION OF FECES  
*Values in grams per day*

Date	Unsaponi- fiable	Neutral fat	Free fatty acids	Soap
9-18	1.97	0.49	0.36	2.30
9-23	0.78	0.41	0.22	1.28
9-28	1.19	0.40	0.36	1.90
10-3	1.06	0.36	0.27	1.71
10-8	1.10	0.62	0.36	1.94
10-13	0.86	0.46	0.25	1.49
10-18	1.12	0.47	0.28	1.74
10-23	1.16	0.42	0.27	1.61
10-28	1.16	0.51	0.37	2.05
11-2	1.14	0.40	0.32	1.87
11-7	1.28	0.58	0.32	1.54

The age given is the initial age at start of study. Dates given are first days of five-day balance periods.

TABLE 329A

Frank  
126 months

CARBON IN INTAKE, URINE, FECES  
*Values in grams per day*

Date	Intake	Urine	Feces	Date	Intake	Urine	Feces
9-18	215.2	—	11.0	10-18	215.2	8.6	9.5
9-23	215.2	—	6.4	10-23	215.2	8.5	9.1
9-28	215.2	8.4	9.3	10-28	215.2	8.6	10.6
10-3	215.2	8.5	8.0				
10-8	215.2	—	10.1	11-2	215.2	8.2	9.3
10-13	215.2	8.5	8.2	11-7	215.2	8.4	11.0

TABLE 330

Frank  
126 months

## VOLUME, WEIGHT AND SULFUR PARTITION OF URINE

*Values are averages per day*

Date	Volume	Specific gravity	Wet weight	Dry weight*	SULFUR PARTITION		
					Inorganic	Ethereal	Neutral
mo.-day	ml.		gm.	gm.	mg.	mg.	mg.
9-18†	1007	1.022	1029	43.7	—	—	—
9-23†	819	1.026	840	44.7	—	—	—
9-28†	893	1.026	916	45.8	617	54	72
10-3†	908	1.026	932	47.0	632	52	72
10-8†	985	1.024	1009	42.9	632	41	81
10-13†	908	1.024	930	45.7	645	46	66
10-18†	909	1.023	930	46.9	660	42	64
10-23†	1015	1.024	1039	47.8	676	52	90
10-28†	943	1.028	969	46.6	642	57	99
11-2†	1020	1.024	1044	46.4	640	52	92
11-7†	992	1.032	1024	47.1	—	—	—
11-7‡	—	—	—	—	629	54	65
11-8‡	—	—	—	—	644	49	75
11-9‡	—	—	—	—	632	43	87
11-10‡	—	—	—	—	650	52	80
11-11‡	—	—	—	—	706	51	65

\* Cryochem dried.

† Determined upon five-day composites and corrected for precipitate solubility.

‡ Determined upon daily urine collections and corrected for precipitate solubility.

TABLE 331

Frank  
126 months

## MANGANESE IN INTAKE, URINE, FECES

*Values are averages per day*

Date	Intake†	Urine*	Feces†	Date	Intake†	Urine*	Feces†
mo.-day	mg.	mg.	mg.	mo.-day	mg.	mg.	mg.
9-18	2.04	0.000	2.18	10-18	2.41	—	2.29
9-23	1.95	0.000	1.66	10-23	2.30	0.000	2.15
9-28	2.23	0.000	2.54	10-28	2.36	0.011	2.42
10-3	2.05	0.005	2.06				
10-8	2.27	0.017	2.46	11-2	2.06	—	2.14
10-13	2.18	0.020	1.82	11-7	2.16	0.006	2.08

The age given is the initial age at start of study. Dates given are first days of five-day balance periods. Italic figures were omitted from calculations of averages given in Volume I.

\* Determined polarographically.

† Determined chemically.

TABLE 332

Frank  
126 months

IRON, COPPER, ZINC IN INTAKE, URINE, FECES\*  
*Values are averages per day*

Date	IRON			COPPER			ZINC		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
9-18	9.92	0.17	6.68	4.60	0.68	1.67	14.76	0.46	14.63
9-23	10.43	0.00	7.59	4.13	0.25	0.96	16.62	0.29	7.13
9-28	12.35	0.00	12.93	5.59	0.20	1.50	16.28	0.26	14.63
10-3	11.06	0.00	11.20	4.79	0.22	1.30	16.38	0.46	9.60
10-8	16.40	0.32	11.84	4.81	0.58	1.64	15.16	0.52	12.96
10-13	11.10	0.12	7.30	4.72	0.35	1.04	17.18	0.69	8.76
10-18	<i>12.76</i>	—	<i>9.31</i>	<i>6.15</i>	—	<i>1.41</i>	<i>15.79</i>	—	<i>12.03</i>
10-23	14.36	0.21	8.17	6.50	0.66	1.31	17.25	0.39	11.13
10-28	13.20	0.00	9.48	5.31	0.32	1.58	16.28	0.43	9.29
11-2	10.23	0.74	8.18	<i>5.29</i>	—	<i>1.32</i>	18.35	0.48	13.86
11-7	8.50	0.82	8.34	5.00	0.82	1.42	15.20	0.55	12.72

The age given is the initial age at start of study. Dates given are first days of five-day balance periods. Italic figures were omitted from calculations of averages given in Volume I.  
\* Determined polarographically.

TABLE 333

Frank  
126 months

IRON, MANGANESE, COPPER, ALUMINUM, LEAD, TIN  
IN INTAKE, FECES\*  
*Values in milligrams per day*

Date	IRON		MANGANESE		COPPER	
	Intake	Feces	Intake	Feces	Intake	Feces
9-18	11.24	—	2.04	—	2.79	—
9-23	10.59	6.98	1.87	1.30	2.37	1.09
9-28	10.11	13.88	2.27	2.38	4.39	1.45
10-3	12.84	7.77	2.03	1.80	3.80	1.82
10-8	14.35	9.64	2.27	2.24	3.67	1.96
10-13	11.80	—	2.16	—	3.65	—
10-18	12.49	8.65	2.19	2.03	6.26	1.64
10-23	12.79	8.00	2.22	1.95	4.29	1.60
10-28	11.36	—	2.18	—	4.75	—
11-2	10.57	—	1.80	—	2.53	—
11-7	9.34	—	1.81	—	2.91	—

	ALUMINUM		LEAD		TIN	
	Intake	Feces	Intake	Feces	Intake	Feces
9-18	4.55	—	0.58	—	1.33	—
9-23	3.95	3.02	0.56	1.09	1.52	0.88
9-28	3.00	8.26	0.52	0.96	1.79	1.72
10-3	3.53	2.57	0.52	0.51	3.32	1.85
10-8	2.58	2.74	0.62	0.40	1.54	2.24
10-13	2.13	—	0.45	—	0.92	—
10-18	3.66	2.44	0.67	0.27	0.77	0.95
10-23	2.86	1.69	0.62	1.39	0.72	0.80
10-28	3.17	—	0.52	—	0.70	—
11-2	3.40	—	0.66	—	0.75	—
11-7	2.29	—	0.52	—	0.76	—

\* Determined spectrographically by the method of Brody, James K. and Ewing, D. T. Spectrographic determination of some metallic elements in food and feces. Indus. Engin. Chem. (Anal. Ed.) 17: 627, 1945.



TABLE 334

Frank

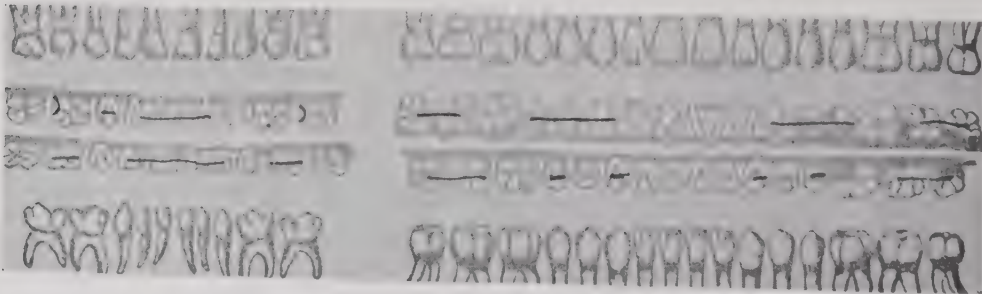
126 months

TITRABLE ACIDITY AND ORGANIC ACID IN URINE

Values in milliequivalents per day

Date	Titration acidity	pH	Total organic acid	Date	Titration acidity	pH	Total organic acid
9-18	10.7	6.35	35.4	10-16	12.0	6.78	35.2
9-19	13.3	6.21	30.6	10-17	13.0	6.88	34.2
9-20	14.3	6.10	29.5	10-18	13.0	6.87	35.8
9-21	9.8	6.82	33.0	10-19	14.6	6.68	37.2
9-22	15.6	6.40	32.2	10-20	11.6	6.95	37.2
9-23	3.5	7.40	31.1	10-21	12.4	6.70	32.1
9-24	26.0	6.30	39.7	10-22	10.4	6.71	40.0
9-25	14.0	6.44	28.7	10-23	18.2	6.46	34.5
9-26	6.4	6.50	27.0	10-24	14.4	6.68	37.4
9-27	18.2	6.39	40.0	10-25	11.8	6.83	30.8
9-28	3.6	7.21	26.6	10-26	8.2	6.76	48.4
9-29	23.8	6.23	43.3	10-27	8.2	6.83	33.4
9-30	17.0	6.36	29.4	10-28	16.5	6.43	33.0
10-1	13.2	6.60	28.8	10-29	11.6	6.69	33.3
10-2	7.5	6.82	33.1	10-30	11.2	6.48	33.6
10-3	9.4	7.00	28.2	10-31	10.6	6.73	35.8
10-4	4.4	7.40	32.2	11-1	8.0	6.78	37.6
10-5	8.9	7.07	29.1	11-2	11.6	6.58	37.0
10-6	4.2	7.00	36.3	11-3	14.2	6.32	34.4
10-7	6.2	6.96	32.0	11-4	15.8	6.45	28.4
10-8	8.4	6.98	33.4	11-5	8.8	6.68	31.6
10-9	3.0	6.72	35.1	11-6	18.4	6.29	28.4
10-10	11.7	7.02	42.0	11-7	7.6	6.88	34.4
10-11	8.3	7.36	36.5	11-8	18.0	6.28	28.4
10-12	11.0	7.06	30.0	11-9	16.5	6.40	37.5
10-13	16.4	6.61	33.0	11-10	14.0	6.53	31.0
10-14	14.8	6.58	30.2	11-11	21.8	6.09	30.0
10-15	13.9	6.77	31.2				

The age given is the initial age at start of study.



FRANK

FIGURE 543. Dental examination, age 127 months.





FRANK

FIGURE 544. Actual size reproduction of roentgenogram of left hand.  
Chronological age 126 months.



FRANK

FIGURE 545. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 126 months.



FRANK

FIGURE 546. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 126 months.



FRANK

FIGURE 547. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 126 months.



FRANK

FIGURE 548. Actual size reproduction of roentgenogram of left hip.  
Chronological age 126 months.





FRANK

FIGURE 549. Actual size reproduction of roentgenogram of left knee.  
Chronological age 126 months.



FRANK

FIGURE 550. Actual size reproduction of roentgenogram of left knee.  
Chronological age 126 months.



FRANK

FIGURE 551. Actual size reproduction of roentgenogram of left foot.  
Chronological age 126 months.



FRANK

FIGURE 552. Actual size reproduction of roentgenogram of left foot.  
Chronological age 126 months.



FRANK

FIGURE 553. Actual size reproduction of roentgenogram of left hand.  
Chronological age 163 months.



## PHYLLIS

### Medical History

Phyllis was a full-term baby, weighing  $5\frac{3}{4}$  pounds at birth. She was breast-fed for four months, walked at ten months and talked at one year. There were no siblings. Phyllis was 76 months old when she joined the study group at the Village. Her medical history showed whooping cough at one year, diphtheria during her third year, and very mild scarlet fever at five years.

During two periods in November Phyllis had diarrhea and the data were excluded from the averages. In December and January she had bronchitis, with her temperature ranging up to  $104^{\circ}$  F. on December 28. She was kept in bed from December 28 to January 4 and did not reenter the study group until January 8. Again in March Phyllis missed three periods because of a cold which started March 16 and persisted until March 24.

### Psychological

Phyllis was given psychological tests at the age of 78 months. On the Stanford-Binet test her M.A. was 90 months, I.Q. 115; on the Arthur Point Scale, M.A. 111 months, I.Q. 142. The examiner reported:

Phyllis is a nice looking little girl with blond hair and rosy cheeks. She was lively, energetic, giggled a great deal, talked in a loud voice with a self-conscious, frequently smart-aleck manner. She made many remarks such as, "Are you trying to kid me? Huh?"—"Oh you will, will you?"—"I know how but I won't tell you"—"You think I can't, don't you?" etc. It was reported by the girls in the experimental cottage that this kind of behavior is not at all characteristic of Phyllis. She showed considerably less of this towards the end of the examining period than she had at first and it was not at any time felt that it interfered with the test results. She conformed well to everything that was asked of her, worked steadily with good concentration and showed a high output of energy which was well directed.

### Endocrinological

Phyllis was 81 months old when classified by the endocrinologist:

Gain of 3.2 inches since October 17, a period of one year, 5 months. Normal increment for this age is 2.0 inches. Two upper central incisors and two lower central incisors present. Right lateral incisor is markedly posterior to the normal line. Left is just beginning to erupt. Slight subcutaneous infiltration with dryness of the skin over both the upper and lower extremities. This is not true of the skin of the torso. No structural endocrine abnormalities.

*Roentgenographic Study for Osseous Development*

Age: 6 years 3 months

Wrist (Anteroposterior)

Carpal bones are all present and normally developed. Distal epiphysis of the ulna, which normally makes its appearance at six, is present. All other centers are present and normally developed.

Elbow (Anteroposterior)

Internal condyle of the humerus, which normally appears at six, is present and normally developed. The proximal epiphysis of the radius, which appears normally at five, is present and is definitely underdeveloped. All other centers are present and normally developed.

Shoulder (Anteroposterior)

Union of the greater tuberosity and head of the humerus, which normally occurs at six, has not been entirely effected.

Knee (Lateral)

All centers are present and normally developed.

Diagnosis: Delay of possibly one year.

TABLE 335

Phyllis  
77 months

PEDOMETER MEASUREMENTS

Date	Miles	Date	Miles	Date	Miles	Date	Miles	Date	Miles
11-16	1 $\frac{3}{8}$	12-22	$\frac{11}{8}$	2-1	$\frac{1}{2}$	3-8	$\frac{3}{8}$	4-18	$\frac{3}{4}$
11-17	$\frac{11}{8}$	1-4	$\frac{7}{8}$	2-2	1 $\frac{1}{4}$	3-14	$\frac{7}{8}$	4-19	$\frac{7}{8}$
12-1	$\frac{11}{8}$	1-5	$\frac{7}{16}$	2-8	$\frac{5}{8}$	3-22	$\frac{1}{4}$	4-25	$\frac{5}{8}$
12-7	$\frac{7}{8}$	1-11	1 $\frac{1}{16}$	2-9	$\frac{3}{4}$	3-28	$\frac{11}{8}$	4-26	1
12-8	$\frac{7}{8}$	1-12	$\frac{5}{8}$	2-15	$\frac{1}{4}$	3-29	$\frac{1}{8}$	5-2	1
12-14	$\frac{7}{8}$	1-18	$\frac{11}{8}$	2-29	1 $\frac{1}{2}$	4-4	$\frac{5}{8}$	5-3	$\frac{5}{8}$
12-15	$\frac{11}{8}$	1-19	$\frac{3}{4}$	3-1	$\frac{1}{4}$	4-5	$\frac{5}{8}$	5-9	1 $\frac{1}{4}$
12-21	1 $\frac{5}{8}$	1-25	$\frac{5}{8}$	3-7	$\frac{11}{8}$	4-11	$\frac{11}{8}$	5-10	$\frac{3}{4}$
		1-26	$\frac{7}{8}$			4-12	$\frac{7}{8}$		

New Haven pedometers were set at 24 inches and worn hooked to belt during hours awake.

TABLE 336

Phyllis

## RECUMBENT LENGTH AND WEIGHT

Age	RECUMBENT LENGTH		Weight	Age	RECUMBENT LENGTH		Weight
	Total	Stem			Total	Stem	
mo.-days	cm.	cm.	kg.	mo.-days	cm.	cm.	kg.
73-8	113.7	—	21.77	80-4	—	—	22.89
75-15	114.9	—	22.00	80-7	118.7	65.7	—
76-4	—	—	20.51	80-9	—	—	23.12
76-13	—	—	20.02	80-14	—	—	23.27
76-17	—	—	20.00	80-19	—	—	23.20
76-20	—	—	20.08	80-22	119.4	66.0	—
76-24	—	—	20.02	80-27	—	—	23.65
76-26	116.2	64.8	—	81-1	—	—	23.45
76-29	—	—	19.96	81-5	—	—	23.72
77-4	—	—	20.22	81-11	—	—	23.80
77-11	—	—	20.23	81-13	120.3	67.0	—
77-14	—	—	20.25	81-16	—	—	24.04
77-15	117.6	64.8	—	81-26	120.0	67.0	23.17
77-19	—	—	20.25	82-2	—	—	23.40
77-27	—	—	20.35	82-7	—	—	23.52
77-29	117.8	64.8	—	82-12	120.6	66.0	23.65
78-1	—	—	20.37	82-16	—	—	23.95
78-4	—	—	20.35	82-18	120.6	66.4	—
78-11	—	—	20.92	82-21	—	—	23.95
78-15	—	—	21.17	82-24	120.5	66.0	—
78-17	118.1	65.6	—	82-28	—	—	24.10
78-20	—	—	21.50	82-29	121.0	67.3	—
78-24	—	—	21.55	83-1	—	—	24.07
79-4	—	—	20.89	83-4	121.0	66.7	—
79-8	118.4	65.4	—	83-6	—	—	24.00
79-10	—	—	21.45	83-10	121.3	67.3	—
79-14	—	—	21.65	83-12	—	—	24.20
79-20	—	—	22.10	83-15	121.3	67.3	—
79-22	118.7	66.0	—	84-13	121.6	67.6	24.52
79-25	—	—	22.45	96-29	—	—	25.29
79-29	—	—	22.65	97-21	127.8	69.7	25.51

Actual values are averages of independent measurements by two workers. In calculating the smooth values given with the balance data the actual values given above were smoothed by three-point averaging and the resulting figures entered for their respective balance periods. Values for balance periods intervening between measurements were obtained by interpolation.

TABLE 337

Phyllis

## HEIGHT AND WEIGHT RECORD\*

Age	Height	Weight	Age	Height	Weight	Age	Height	Weight
months	inches	pounds	months	inches	pounds	months	inches	pounds
65	43	40 $\frac{3}{4}$	73	44 $\frac{1}{2}$	44 $\frac{1}{4}$	79	46 $\frac{1}{4}$	48 $\frac{3}{4}$
68	43	41	75	45 $\frac{1}{8}$	46 $\frac{1}{4}$	81	47	53 $\frac{1}{2}$
			77	45 $\frac{3}{4}$	46 $\frac{3}{4}$			

\* Clinical. See also table of recumbent lengths and weights.

TABLE 338

Phyllis

BASAL METABOLISM MEASUREMENTS

Age	Date	Sur- face area*	Respi- ration	Pulse rate	Body temper- ature	Blood pres- sure	Basal metab- olism
months	mo.-day	sq.m.	per min.	per min.	°F	S/D†	Cal./24 h
76	10-11	0.803	28	—	—	—	900
77	10-27	0.806	28	—	—	—	842
77	11-15	0.818	21	75	98.3	89/67	876
78	11-29	0.821	16	76	97.8	78/58	804
79	12-17	0.836	12	92	98.0	86/62	826
79	1-7	0.842	12	90	98.4	86/60	763
80	1-21	0.854	18	95	98.6	89/62	934
81	2-20	0.878	17	104	98.3	99/73	970
81	3-12	0.892	17	86	98.2	86/64	934
82	3-25	0.879	16	84	98.2	96/64	898
82	3-29	0.876	16	84	98.2	84/68	989
82	4-3	0.876	15	108	98.8	98/66	955
82	4-10	0.890	18	93	98.2	92/76	948
82	4-16	0.895	14	99	98.4	92/68	950
83	4-22	0.895	18	98	98.6	96/72	936
83	4-27	0.899	17	104	98.1	98/70	984
83	5-2	0.898	21	118	99.2	96/62	1164
83	5-8	0.901	17	100	98.2	96/70	1042
83	5-13	0.902	18	92	98.7	94/64	938

\* DuBois formula.  
† Systolic/Diastolic.

TABLE 339

Phyllis  
82 months

TEMPERATURE AND PULSE

Date	Temper- ature	Pulse	Date	Temper- ature	Pulse	Date	Temper- ature	Pulse
4-7	98.4	88	4-19	98.4	96	5-2	99.2	116
4-8	98.1	96	4-20	98.2	89	5-3	99.0	104
4-9	98.2	92	4-21	98.2	89	5-4	98.6	108
4-10	98.2	93	4-22	98.6	96	5-5	98.2	104
4-11	98.8	84	4-23	98.4	86	5-6	98.6	92
4-12	98.2	78	4-24	98.6	96	5-7	98.2	96
			4-25	99.0	96			
4-13	98.4	88	4-26	98.4	96	5-8	98.2	100
4-14	98.2	88	4-27	98.1	104	5-9	98.4	100
4-15	98.4	100	4-28	98.4	104	5-10	98.7	96
4-16	98.4	100	4-29	98.6	108	5-11	98.2	104
4-17	98.2	96	4-30	98.6	99	5-12	98.4	96
4-18	98.2	96	5-1	98.4	108	5-13	98.7	92



TABLE 340

Phyllis  
76 months

FOOD INTAKE  
*Values in grams per day*

Food	DATE						
	9-30 to 11-4	11-4 to 12-4	12-4 to 1-13	1-13 to 2-7	2-7 to 3-3	3-3 to 3-13	3-28 to 5-12*
Apple	100	100	100	100	100	100	100
Ascorbic acid	—	—	—	.02	.02	—	—
Banana	100	100	200	200	200	200	100
Beef, lean	100	100	100	100	100	100	100
Bread, white	20	20	70	70	70	70	70
Bread, whole wheat	30	30	30	30	30	30	30
Butter	20	20	30	30	36	35	48
Cabbage	25	25	25	25	25	25	25
Carrot	25	25	25	25	25	25	25
Cheese, American	15	15	15	15	15	15	15
Corn flakes	15	15	15	15	15	15	15
Egg, whole	50	50	50	50	50	50	50
Graham cracker	18	18	18	18	18	18	18
Lettuce	20	20	20	20	20	20	20
Milk, fluid	400	400†	400†	400†	400†	400†	400†
Orange concentrate	50	50	50	50	—	—	—
Orange juice, fresh	—	—	—	—	—	50	50
Peanut butter	16	16	16	16	16	16	16
Potato	40	40	70	70	70	70	70
Salt	2	2	2	2	2	2	2
Shredded wheat	15	15	15	15	15	15	15
Spinach	—	—	—	—	—	100	—
Sugar (average)	6	2	4	6	8	10	10
Tomato juice	60	60	60	60	60	60	60
Water (average)	270	276	409	375	346	384	493

\* Thyroid gland (Parke, Davis & Co.) desiccated, 0.25 grain daily April 7 to 22; 6 grains daily April 22 to 27.

† Irradiated. Evaporated milk diluted 1:1.

TABLE 341

Phyllis

BLOOD DETERMINATIONS

Age	Date	Red cells	Hemo- globin*	WHITE BLOOD CELLS				
				Total	Poly- morpho- nuclears	Lym- pho- cytes	Mono- cytes	Eosino- philes
months	mo.-day	millions	gm./100 cc.	per c. mm.	per cent	per cent	per cent	per cent
73	7-6	4.47	12	7500	45	48	6	1
75	9-16	5.28	13	6150	66	27	4	3
81	3-13	4.99	13	8050	37	48	14	1
83	5-14	4.61	13	10200	59	31	7	1
MINERALS (mg. per 100 ml.)								
Serum calcium				Serum phosphorus				
75	9-16	10.5			4.75			

\* Haden-Hausser hemoglobinometer.



TABLE 342

Phyllis  
76 months

## BODY LENGTH AND WEIGHT—INTAKE AND ELIMINATION

Date	Recumbent length*	Weight*	INTAKE			AVERAGE DAILY HEAT OF COMBUSTION			FECES				
			AVERAGE DAILY						AVERAGE DAILY			Laxation rate†	Elimination time‡
			Dry wt.‡	Total water†	Fat	In-take	Urine	Feces	Wet wt.	Dry wt.‡	Fat		
mo.-day	cm.	kg.	gm.	gm.	gm.	Cal.	Cal.	Cal.	gm.	gm.	gm.		hours
9-30	116	20.52	318	1177	57.5	1636	63	78	100.0	8.0	0.8	1.0	25
10-5	116	20.35	315	1056	57.5	1621	64	50	92.2	12.0	1.1	1.0	32
10-10	116	20.18	316	1088	57.5	1628	69	42	87.0	16.0	1.8	0.8	50
10-15	116	20.03	318	1113	57.5	1634	66	63	76.8	14.0	1.5	0.6	50
10-20	117	20.03	315	1035	57.5	1624	67	55	58.4	13.0	1.4	1.0	35
10-25	117	20.02	312	992	57.5	1609	—	70	64.6	18.0	2.1	0.8	26
10-30	117	20.07	318	1178	57.5	1634	64	70	80.6	17.0	2.0	1.0	25
11-4	117	20.14	310	980	59.7	1617	66	57	61.8	14.0	1.6	1.0	55
11-9	117	20.23	307	1030	59.7	1607	66	52	65.2	10.0	1.0	1.2	34
11-14	117	20.24	308	1337	59.7	1608	64	274	351.4	44.0	19.7	2.0	32
11-19	117	20.28	309	1340	59.7	1612	63	111	95.4	19.0	5.3	1.0	51
11-24	118	20.32	310	1131	59.7	1618	62	—	77.4	13.0	1.4	0.8	57
11-29	118	20.36	307	1141	59.7	1605	63	36	59.4	13.0	1.5	0.6	72
12-4	118	20.55	380	1322	74.0	1967	63	68	82.0	14.0	1.6	1.2	36
12-9	118	20.81	378	1276	74.0	1961	69	77	70.6	19.0	2.4	1.2	35
12-14	118	21.20	380	1281	74.0	1967	68	49	82.2	12.0	1.5	1.2	35
12-19	118	21.41	379	1365	74.0	1962	68	76	93.8	16.0	1.9	1.2	24
###													
1-8	118	21.33	382	1302	74.0	1976	61	80	111.8	22.0	2.2	1.4	11
1-13	118	21.73	388	1234	74.0	1975	62	102	134.8	23.0	2.4	1.2	26
1-18	119	22.07	392	1318	74.0	1990	66	81	85.0	17.0	1.6	1.0	35
1-23	119	22.40	387	1353	74.0	1970	63	77	104.4	16.0	1.7	1.0	25
1-28	119	22.66	386	1258	74.0	1967	66	90	106.6	20.0	1.9	1.4	11
2-2	119	22.89	392	1360	74.0	1992	66	88	105.4	14.0	1.6	1.0	25
2-7	119	23.09	375	1243	80.0	1895	68	85	98.6	21.0	2.5	1.2	34
2-12	119	23.20	379	1256	80.0	1912	66	82	76.6	15.0	1.8	1.2	8
2-17	120	23.37	373	1228	80.0	1978	66	93	102.2	17.0	3.1	1.4	12
2-22	120	23.43	375	1204	80.0	1986	55	85	93.6	19.0	3.1	0.8	30
2-27	120	23.61	374	1305	80.0	1980	66	92	118.2	19.0	2.3	1.6	30
3-3	120	23.66	396	1393	82.1	1984	68	88	91.4	20.0	2.3	1.0	54
3-8	120	23.85	402	1397	82.1	2009	70	89	92.2	21.0	2.5	1.4	30
###													
3-28	119	23.36	358	1256	92.5	1983	64	84	120.8	20.0	2.1	1.2	26
4-2	120	23.52	359	1281	92.5	1987	61	81	121.0	20.0	2.4	1.2	30
4-7	120	23.71	361	1281	92.5	1993	67	77	124.2	15.0	1.6	1.2	25
4-12	121	23.85	361	1281	92.5	1995	65	80	98.6	19.0	2.1	1.0	12
4-17	121	24.00	362	1281	92.5	1998	67	87	79.2	21.0	2.6	1.0	26
4-22	121	24.04	359	1321	92.5	1986	64	106	89.4	21.0	2.4	1.2	10
4-27	121	24.06	356	1491	92.5	1973	72	96	104.8	18.0	2.4	1.2	11
5-2	121	24.09	367	1391	92.5	2017	69	92	112.0	19.0	2.6	1.0	30
5-7	121	24.13	363	1786	92.5	2001	60	79	87.6	19.0	2.6	0.8	50

The age given is the initial age at start of study. Dates given are first days of five-day balance periods. Italic figures were omitted from calculations of the averages given in Volume I.

\* See Table 336 for actual values and method of smoothing.

† Based on alcohol-dried food and oven-dried feces.

‡ Drinking water plus water in foods.

§ Average number of defecations per day.

¶ Elapsed time between ingestion and defecation of marker used to separate feces of five-day periods.

\* See history, page 1049, for explanation for missing periods.

TABLE 343

Phyllis  
76 monthsNITROGEN AND NEGATIVE MINERALS IN INTAKE, URINE, FECES  
*Values are averages per day*

Date	NITROGEN			PHOSPHORUS			CHLORINE			SULFUR		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
9-30	9.45	8.66	0.99	996	639	319	3031	2840	9	612	585	70
10-5	9.45	8.48	1.34	996	652	282	3031	2670	5	612	531	53
10-10	9.45	8.79	0.91	996	589	361	3031	2783	8	612	572	69
10-15	9.45	8.46	0.84	996	570	377	3031	2778	3	612	568	69
10-20	9.45	8.82	0.80	996	528	341	3031	2946	0	612	578	61
10-25	9.45	8.56	0.80	996	600	402	3031	2652	6	612	593	70
10-30	9.45	8.82	0.98	996	681	358	3031	3033	0	612	610	75
11-4	9.45	8.93	0.87	996	637	330	3031	2898	40	612	590	64
11-9	9.45	8.88	0.49	996	558	303	3031	3000	40	612	580	53
11-14	9.45	8.60	2.11	996	588	484	3031	2430	269	612	599	139
11-19	9.45	8.36	1.15	996	534	413	3031	2689	29	612	743	84
11-24	9.45	8.61	0.79	996	567	382	3031	2851	36	612	545	67
11-29	9.45	8.86	0.69	996	580	260	3031	2760	14	612	558	41
12-4	10.43	8.84	1.00	1103	581	322	3524	3410	79	699	558	70
12-9	10.43	8.81	0.92	1103	635	369	3524	3271	56	699	570	78
12-14	10.43	8.81	0.95	1103	618	205	3524	2995	40	699	578	48
12-19	10.43	8.83	1.16	1103	604	327	3524	2895	66	699	573	73
***												
1-8	10.43	7.89	0.97	1103	568	282	3524	3120	81	699	495	81
1-13	10.43	7.95	1.39	1103	594	309	3524	3434	63	699	493	96
1-18	10.43	8.09	1.10	1103	602	281	3524	3293	39	699	520	86
1-23	10.43	7.88	1.28	1103	585	262	3524	3216	29	699	513	75
1-28	10.43	8.05	1.20	1103	689	279	3524	3366	24	699	531	86
2-2	10.43	8.27	1.13	1103	676	284	3524	3534	34	699	541	86
2-7	10.43	8.37	1.20	1100	676	292	3522	3048	34	697	553	88
2-12	10.43	8.45	1.08	1100	690	266	3522	3348	27	697	555	79
2-17	10.43	8.63	1.27	1100	649	297	3522	3330	26	697	575	83
2-22	10.43	8.22	1.05	1100	686	298	3522	3162	53	697	535	88
2-27	10.43	8.19	1.22	1100	696	302	3522	2976	57	697	542	96
3-3	10.79	8.60	1.10	1202	720	342	4067	3745	64	733	577	101
3-8	10.79	8.79	1.22	1202	731	297	4067	3816	49	733	608	96
***												
3-28	10.39	8.21	1.22	1088	651	313	3418	3360	50	698	564	83
4-2	10.39	7.55	1.23	1088	608	251	3418	3420	93	698	504	79
4-7	10.39	8.54	1.18	1088	721	251	3418	3336	79	698	539	76
4-12	10.39	8.40	1.11	1088	691	287	3418	3318	56	698	545	87
4-17	10.39	8.59	1.06	1088	701	345	3418	3126	57	698	552	99
4-22	10.39	8.33	1.09	1088	676	366	3418	3198	124	698	537	118
4-27	10.39	9.35	1.25	1088	758	312	3418	3240	61	698	589	92
5-2	10.39	8.74	1.16	1088	681	313	3418	3295	55	698	561	83
5-7	10.39	7.59	1.05	1088	655	314	3418	3156	45	698	492	77

\* See footnotes to Table 342.

TABLE 344

Phyllis  
76 months

## POSITIVE MINERALS IN INTAKE, URINE, FECES

*Values are averages per day*

Date	CALCIUM			MAGNESIUM			SODIUM			POTASSIUM		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
9-30	722	90	584	248	88	144	1876	1857	27	2252	1646	459
10-5	722	96	501	248	79	132	1876	1744	18	2252	1725	302
10-10	722	102	564	248	85	146	1876	1720	40	2252	1534	315
10-15	722	88	547	248	78	122	1876	1798	32	2252	1980	247
10-20	722	91	558	248	81	68	1876	1916	00	2252	1910	182
10-25	722	91	566	248	75	104	1876	1787	18	2252	1934	181
10-30	722	96	733	248	79	147	1876	1701	14	2252	2031	343
11-4	722	113	717	248	81	174	1876	1852	19	2252	2028	217
11-9	722	97	357	248	80	73	1876	1858	00	2252	1900	118
11-14	722	78	636	248	46	190	1876	1843	511	2252	1470	880
11-19	722	68	656	248	41	175	1876	1598	66	2252	1706	307
11-24	722	85	600	248	76	138	1876	1877	20	2252	2020	254
11-29	722	89	624	248	96	132	1876	1694	9	2252	1650	197
12-4	772	101	636	299	99	166	2180	2142	17	2822	2303	241
12-9	772	97	604	299	103	126	2180	2104	00	2822	2343	220
12-14	772	100	567	299	98	129	2180	1917	00	2822	2382	282
12-19	772	99	656	299	93	159	2180	2081	15	2822	2413	272
***												
1-8	772	79	488	299	114	159	2180	1959	58	2822	2025	402
1-13	772	93	632	299	133	201	2180	2095	70	2822	2248	557
1-18	772	98	528	299	125	132	2180	2044	00	2822	2335	223
1-23	772	96	580	299	116	170	2180	1966	37	2822	2321	334
1-28	772	99	562	299	104	173	2180	2080	38	2822	2254	334
2-2	772	79	522	299	104	154	2180	2113	27	2822	2313	290
2-7	768	70	524	296	106	158	2178	1986	47	2786	2319	264
2-12	768	73	501	296	111	149	2178	2140	00	2786	2320	212
2-17	768	82	557	296	104	169	2178	2106	34	2786	2270	343
2-22	768	67	500	296	94	158	2178	2009	29	2786	2442	281
2-27	768	64	528	296	95	176	2178	1828	54	2786	2113	315
3-3	830	70	555	369	111	196	2549	2409	33	3167	2274	285
3-8	830	82	549	369	115	218	2549	2478	30	3167	2607	270
***												
3-28	775	66	545	282	95	158	2169	2033	55	2676	1921	391
4-2	775	72	507	282	85	147	2169	2044	51	2676	1917	369
4-7	775	92	512	282	100	143	2169	2033	69	2676	1867	388
4-12	775	91	493	282	104	133	2169	2008	38	2676	1967	294
4-17	775	94	484	282	108	133	2169	1884	00	2676	2152	258
4-22	775	96	469	282	101	134	2169	1938	25	2676	2010	275
4-27	775	115	541	282	113	138	2169	1963	34	2676	2104	330
5-2	775	124	556	282	104	138	2169	2040	38	2676	1848	352
5-7	775	84	536	282	100	128	2169	1930	34	2676	1800	317

\* See footnotes to Table 342.

TABLE 345

Phyllis  
76 monthsCOMPLEX CARBOHYDRATES IN INTAKE AND FECES  
*Values in grams per day*

Date	LIGNIN		CELLULOSE		HEMICELLULOSE		
	Intake	Feces	Intake	Feces	INTAKE		Feces
					Total	Stable	
9-30	1.28	0.57	2.08	0.66	2.17	1.72	0.73
10-5	1.28	1.08	2.08	1.14	2.17	1.72	0.74
10-10	1.28	1.24	2.08	0.82	2.17	1.72	1.18
10-15	1.28	1.05	2.08	0.78	2.17	1.72	0.79
10-20	1.28	1.23	2.08	0.82	2.17	1.72	0.91
10-25	1.28	1.48	2.08	1.06	2.17	1.72	1.22
10-30	1.28	1.55	2.08	1.01	2.17	1.72	1.34
11-4	1.28	1.38	2.08	0.61	2.17	1.72	0.91
11-9	1.28	0.92	2.08	0.63	2.17	1.72	0.50
***							
11-24	1.31	1.15	2.14	0.94	2.35	1.93	0.77
11-29	1.24	1.28	2.03	1.02	1.99	1.52	0.76
12-4	1.79	1.34	2.56	1.02	2.62	2.02	0.96
12-9	1.79	2.48	2.56	1.13	2.62	2.02	1.34
12-14	1.79	1.28	2.56	0.45	2.62	2.02	0.72
12-19	1.79	1.84	2.56	0.96	2.62	2.02	1.06
***							
1-8	1.79	1.86	2.56	1.57	2.62	2.02	1.25
1-13	1.79	2.94	2.56	1.60	2.62	2.02	1.24
1-18	1.76	2.22	2.50	0.74	2.44	1.82	0.93
1-23	1.79	1.68	2.56	0.66	2.62	2.02	0.90
1-28	1.79	2.10	2.56	0.82	2.62	2.02	1.12
2-2	1.79	1.52	2.56	0.72	2.62	2.02	0.78
2-7	1.79	1.39	2.56	1.16	2.62	2.02	1.14
2-12	1.79	1.91	2.56	0.72	2.62	2.02	0.88
***							
2-22	1.79	2.30	2.56	0.71	2.62	2.02	1.01
2-27	1.79	2.32	2.56	1.03	2.62	2.02	0.98
3-3	1.92	2.38	2.84	0.82	2.76	2.12	1.12
3-8	1.92	2.72	2.84	0.66	2.76	2.12	1.08
***							
3-28	1.36	1.61	2.37	1.02	2.65	2.09	1.07
4-2	1.33	1.50	2.32	1.12	2.47	1.89	0.98
4-7	1.33	1.19	2.32	1.07	2.47	1.89	0.76
4-12	1.33	1.88	2.32	0.77	2.47	1.89	1.07
4-17	1.33	2.30	2.32	0.63	2.47	1.89	1.22
4-22	1.33	1.50	2.32	1.01	2.47	1.89	1.32
4-27	1.33	1.59	2.32	0.82	2.47	1.89	0.97
5-2	1.33	1.94	2.32	0.98	2.47	1.89	1.18
5-7	1.33	1.70	2.32	0.81	2.47	1.89	1.05



TABLE 346

Phyllis  
82 months

## NITROGEN PARTITION OF URINE

*Values in grams of nitrogen per day*

Date	Total nitrogen	Urea	Ammonia	Creatinine + Creatine	Creatinine	Uric acid
3-28	8.07	6.941	0.259	0.288	0.169	0.112
3-29	7.70	6.765	0.275	0.299	0.197	0.134
3-30	7.82	6.755	0.305	0.330	0.141	0.108
3-31	7.76	6.875	0.305	0.313	0.163	0.121
4-1	9.72	8.876	0.344	0.381	0.197	0.143
4-2	7.35	6.184	0.316	0.288	0.166	0.129
4-3	7.25	6.106	0.274	0.296	0.175	0.123
4-4	7.49	6.004	0.296	0.330	0.177	0.123
4-5	7.14	6.193	0.267	0.336	0.173	0.132
4-6	8.54	7.510	0.310	0.365	0.206	0.130
4-7	8.28	7.316	0.284	0.343	0.167	0.140
4-8	6.59	5.840	0.260	0.261	0.140	0.107
4-9	11.40	9.649	0.451	0.368	0.229	0.154
4-10	8.85	6.037	0.323	0.392	0.197	0.129
4-11	7.56	6.652	0.268	0.315	0.157	0.121
4-12	8.92	7.593	0.317	0.415	0.206	0.139
4-13	8.02	7.125	0.315	0.371	0.171	0.128
4-14	8.26	7.295	0.265	0.374	0.193	0.122
4-15	8.44	7.207	0.293	0.372	0.177	0.116
4-16	8.34	7.357	0.285	0.355	0.188	0.129
4-17	8.90	7.887	0.299	0.394	0.199	0.134
4-18	8.62	7.609	0.285	0.312	0.205	0.134
4-19	8.50	7.469	0.301	0.287	0.190	0.128
4-20	8.25	7.285	0.259	0.315	0.190	0.135
4-21	8.68	7.755	0.295	0.283	0.167	0.128
4-22	8.06	7.150	0.316	0.281	0.157	0.115
4-23	8.32	7.391	0.246	0.310	0.199	0.123
4-24	8.55	7.307	0.309	0.286	0.216	0.131
4-25	8.36	7.407	0.341	0.295	0.169	0.119
4-26	8.34	7.340	0.306	0.295	0.188	0.122
4-27	9.63	8.383	0.331	0.359	0.189	0.135
4-28	9.12	7.892	0.299	0.371	0.196	0.138
4-29	9.18	7.906	0.334	0.420	0.175	0.120
4-30	9.06	8.236	0.297	0.417	0.190	0.126
5-1	9.74	8.434	0.332	0.456	0.207	0.116
5-2	9.04	7.657	0.295	0.332	0.193	0.124
5-3	8.86	7.644	0.310	0.350	0.183	0.120
5-4	9.11	7.925	0.289	0.356	0.184	0.131
5-5	8.54	7.557	0.273	0.261	0.182	0.120
5-6	8.14	7.410	0.296	0.261	0.173	0.115
5-7	7.74	6.965	0.325	0.253	0.165	0.123
5-8	7.90	6.893	0.299	0.282	0.208	0.124
5-9	7.62	6.852	0.284	0.198	0.184	0.125
5-10	7.46	6.460	0.294	0.294	0.210	0.122
5-11	7.25	6.804	0.314	0.230	0.195	0.129

The age given is the initial age at start of study.



TABLE 347

Phyllis  
76 months

IRON IN INTAKE, URINE AND FECES  
*Values are averages per day*

Date	Intake	Urine	Feces	Date	Intake	Urine	Feces	Date	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mo.-day	mg.	mg.	mg.	mo.-day	mg.	mg.	mg.
9-30	7.39	0.31	3.52	12-4	8.50	0.46	5.76	2-22	8.46	0.12	5.60
10-5	7.39	0.33	4.89	12-9	8.50	0.00	8.79	2-27	8.46	0.09	5.08
10-10	7.39	0.28	6.56	12-14	8.50	0.24	5.06	3-3	9.48	0.13	7.55
10-15	7.39	0.00	6.23	12-19	8.50	0.06	6.86	3-8	9.48	0.23	7.69
10-20	7.39	0.20	7.00	§§§				§§§			
				1-8	8.50	0.08	6.82	3-28	8.20	0.24	6.95
10-25	<i>7.39</i>	—	<i>10.22</i>	1-13	8.50	0.07	7.48	4-2	8.20	0.39	6.08
10-30	7.39	0.24	9.71	1-18	8.50	0.08	6.40	4-7	8.20	0.22	4.82
11-4	7.40	0.50	7.30	1-23	8.50	0.12	5.32	4-12	8.20	0.00	6.94
11-9	7.40	0.60	4.69	1-28	8.50	0.12	6.08				
11-14	<i>7.40</i>	<i>0.11</i>	<i>8.03</i>					4-17	8.20	0.31	8.69
				2-2	8.50	0.12	4.25	4-22	8.20	0.06	7.69
11-19	<i>7.40</i>	<i>0.02</i>	<i>7.48</i>	2-7	8.46	0.08	6.75	4-27	8.20	0.02	6.44
11-24	7.40	0.00	6.37	2-12	8.46	0.22	4.80	5-2	8.20	0.09	6.82
11-29	7.40	0.01	6.19	2-17	8.46	0.08	4.97	5-7	8.20	0.19	7.50

The age given is the initial age at start of study. Dates given are first days of five-day balance periods. *Italic figures were omitted from calculations of averages given in Volume I.*  
§§§ See case history, page 1049, for explanation for missing periods.

TABLE 348

Phyllis

ANTHROPOMETRIC MEASUREMENTS  
*Values in centimeters*

Age*	BREADTH			LENGTH		WIDTH	
	Biacro-mial	Intertro- chanteric	Inter- crystal	Tibia	Head	Chest	Head
77	21.7	19.7	19.0	24.0	17.7	16.7	13.6
78	22.5	19.8	18.0	24.8	17.6	16.5	13.4
79	22.3	20.1	19.0	24.4	17.5	17.3	13.5
81	22.6	20.7	18.8	24.6	17.8	16.0	13.7
81	22.5	20.7	19.7	24.5	17.9	17.2	13.6
82	21.8	20.8	19.6	25.1	18.2	17.1	13.7
83	22.8	21.4	19.7	25.7	17.8	16.9	13.7
84	23.5	20.3	18.8	25.3	18.0	17.0	13.6
97	23.2	21.3	20.0	26.8	17.9	18.2	13.8

Age*	DEPTH	CIRCUMFERENCES				
	Chest	Head	Chest	Thigh	Abdomen	Upper arm
77	13.0	49.3	50	33	50	16.0
78	13.0	50.0	49	32	49	16.0
79	13.5	49.5	50	34	51	17.0
81	13.0	50.2	52	36	51	17.4
81	12.7	49.6	54	37	52	18.2
82	13.5	50.0	52	36	56	18.0
83	13.5	50.2	53	37	52	18.0
84	13.7	50.2	54	36	52	17.4
97	13.0	50.8	54	37	53	18.0

\* Months.

SKELETAL MATURATION  
*Values in months*

Chrono- logical age	HAND			FOOT	ELBOW	KNEE	HIP	SHOULDER	AVERAGE
	B.B.G.*	Flory†	Todd‡	Todd‡	Todd‡	Todd‡	Todd‡	Todd‡	Todd‡
73	82	65	82	81	82	83	81	79	82
75	91	72	86	83	84	84	83	80	84
81	97	76	93	88	90	90	90	87	90
83	98	78	95	93	93	94	95	91	94
97	111	89	101	96	95	95	93	101	97

\* Baldwin, B. T., Busby, L. M., Garside, H. V. Anatomic growth of children. University of Iowa Studies in Child Welfare, vol. 4, no. 1, 1928.  
† Flory, C. D. Osseous development in the hand as an index of skeletal development. Monographs of the Society for Research in Child Development, vol. 1, no. 3, 1936.  
‡ Determined by T. Wingate Todd, C. C. Francis, and Idell Pyle, Western Reserve University, Cleveland.

MEASUREMENTS OF THE BONES OF THE WRIST

AGE, months	73	75	81	83	97
CARPALS					
AREA, sq. mm.					
Hamate	78	87	92	92	109
Capitate	126	139	145	146	167
Lesser Multangular	24	28	32	34	46
Greater Multangular	39	43	53	54	70
Navicular	51	60	63	67	96
Lunate	50	60	65	64	80
Triangular	45	44	48	50	63
Pisiform				18	26
GREATEST DIAMETER, mm.					
Hamate	12	13	13	13	15
Capitate	16	17	18	18	19
Lesser Multangular	6	7	8	8	8
Greater Multangular	7	9	10	10	12
Navicular	10	10	10	11	13
Lunate	9	10	11	11	12
Triangular	9	10	10	10	11
Pisiform				4	6
Epiphyses					
1st Metacarpal	8	9	9	9	10
2nd Metacarpal	9	10	11	11	11
3rd Metacarpal	8	10	10	11	11
4th Metacarpal	7	8	9	9	9
ULNA					
DIAMETER, mm.					
Distal epiphysis	3	4	6	7	12
Distal metaphysis	13	12	13	13	15
RADIUS					
DIAMETER, mm.					
Distal epiphysis	18	18	19	20	22
WRIST AREA,* sq. mm.	982	966	967	1019	1086

\* Measured with the planimeter using Flory's landmarks (Monographs of the Society for Research in Child Development, Vol. I, No. 3, 1936).

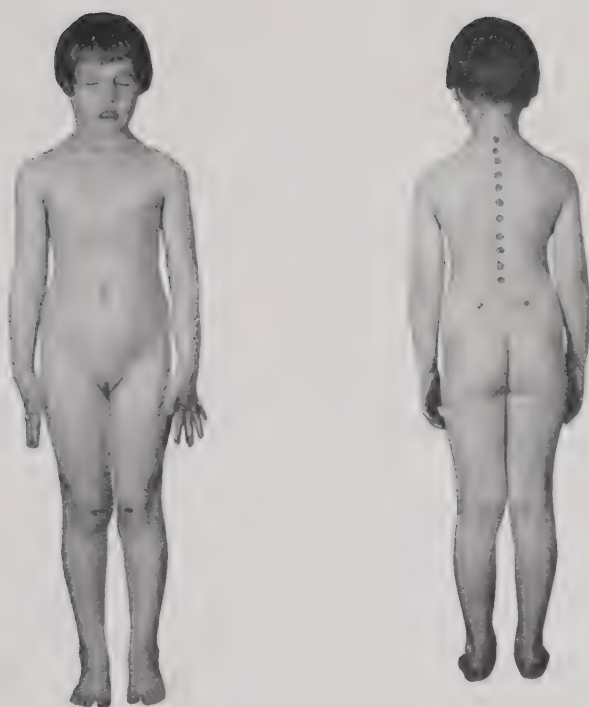


FIGURE 554. PHYLLIS age 79 months.



## PHYLLIS

FIGURE 555. Actual size reproduction of roentgenogram of left hand.  
Chronological age 73 months.



## PHYLLIS

FIGURE 556. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 73 months.





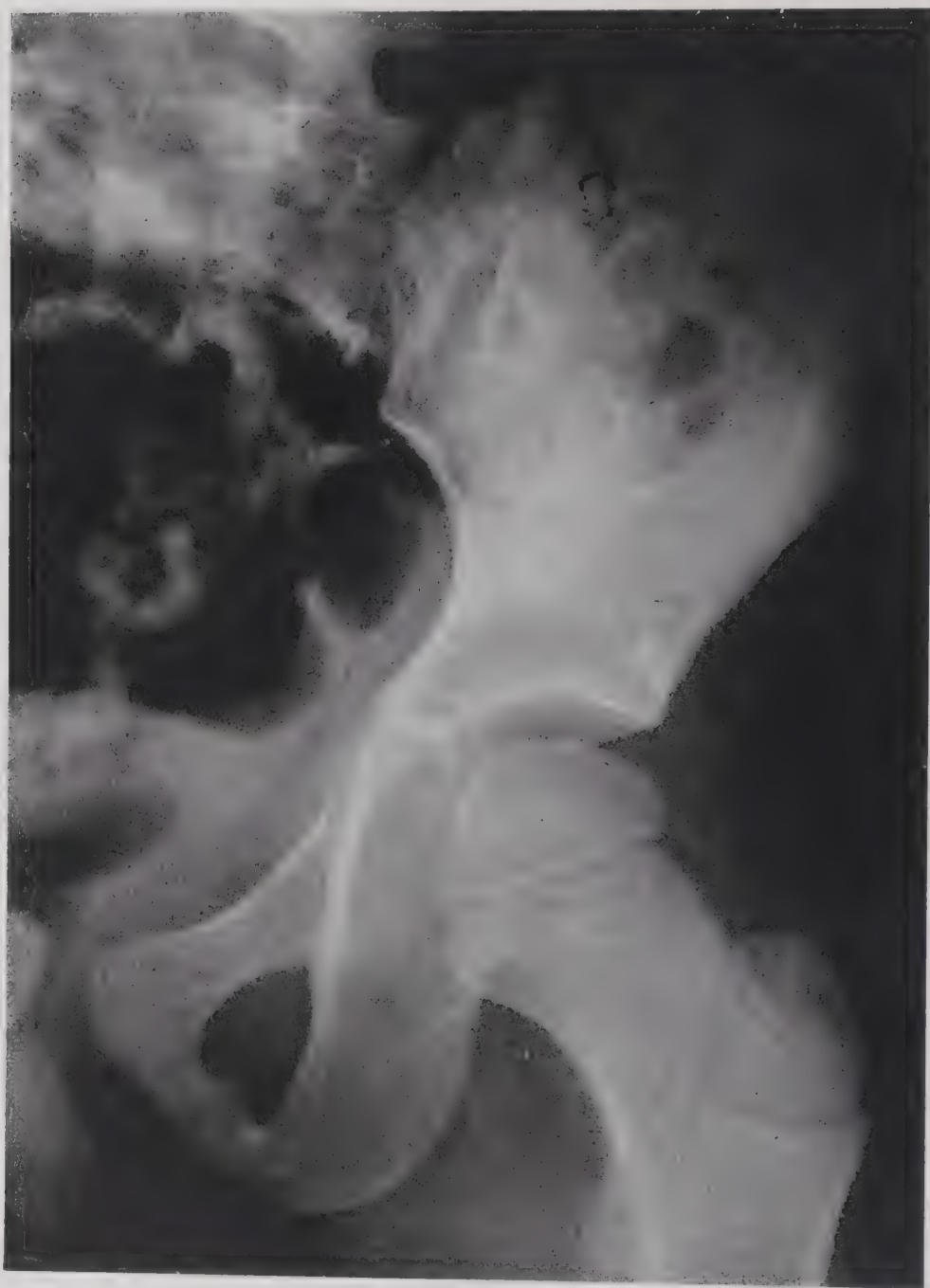
## PHYLLIS

FIGURE 557. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 73 months.



## PHYLLIS

FIGURE 558. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 73 months.



## PHYLLIS

FIGURE 559. Actual size reproduction of roentgenogram of left hip.  
Chronological age 73 months.



## PHYLLIS

FIGURE 560. Actual size reproduction of roentgenogram of left knee.  
Chronological age 73 months.



## PHYLLIS

FIGURE 561. Actual size reproduction of roentgenogram of left knee.  
Chronological age 73 months.





PHYLLIS

FIGURE 562. Actual size reproduction of roentgenogram of left foot.  
Chronological age 73 months.



PHYLLIS

FIGURE 563. Actual size reproduction of roentgenogram of left foot.  
Chronological age 73 months.



## PHYLLIS

FIGURE 564. Actual size reproduction of roentgenogram of left hand.  
Chronological age 75 months.



## PHYLLIS

FIGURE 565. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 75 months.



## PHYLLIS

FIGURE 566. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 75 months.





## PHYLLIS

FIGURE 567. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 75 months.



## PHYLLIS

FIGURE 568. Actual size reproduction of roentgenogram of left hip.  
Chronological age 75 months.



## PHYLLIS

FIGURE 569. Actual size reproduction of roentgenogram of left knee.  
Chronological age, 75 months.



## PHYLLIS

FIGURE 570. Actual size reproduction of roentgenogram of left knee.  
Chronological age 75 months.



PHYLLIS

FIGURE 571. Actual size reproduction of roentgenogram of left foot.  
Chronological age 75 months.





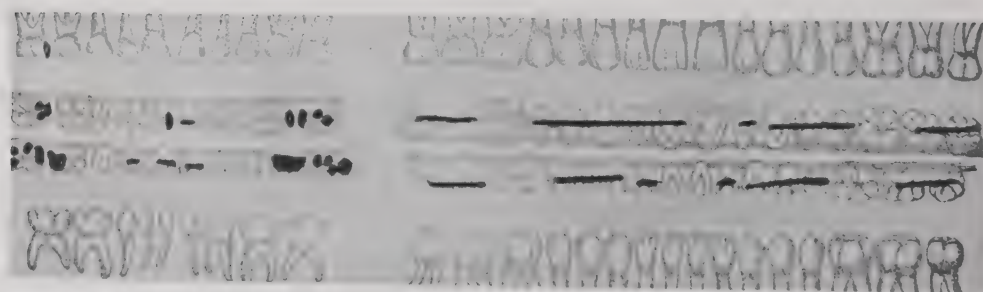
PHYLLIS

FIGURE 572. Actual size reproduction of roentgenogram of left foot.  
Chronological age 75 months.



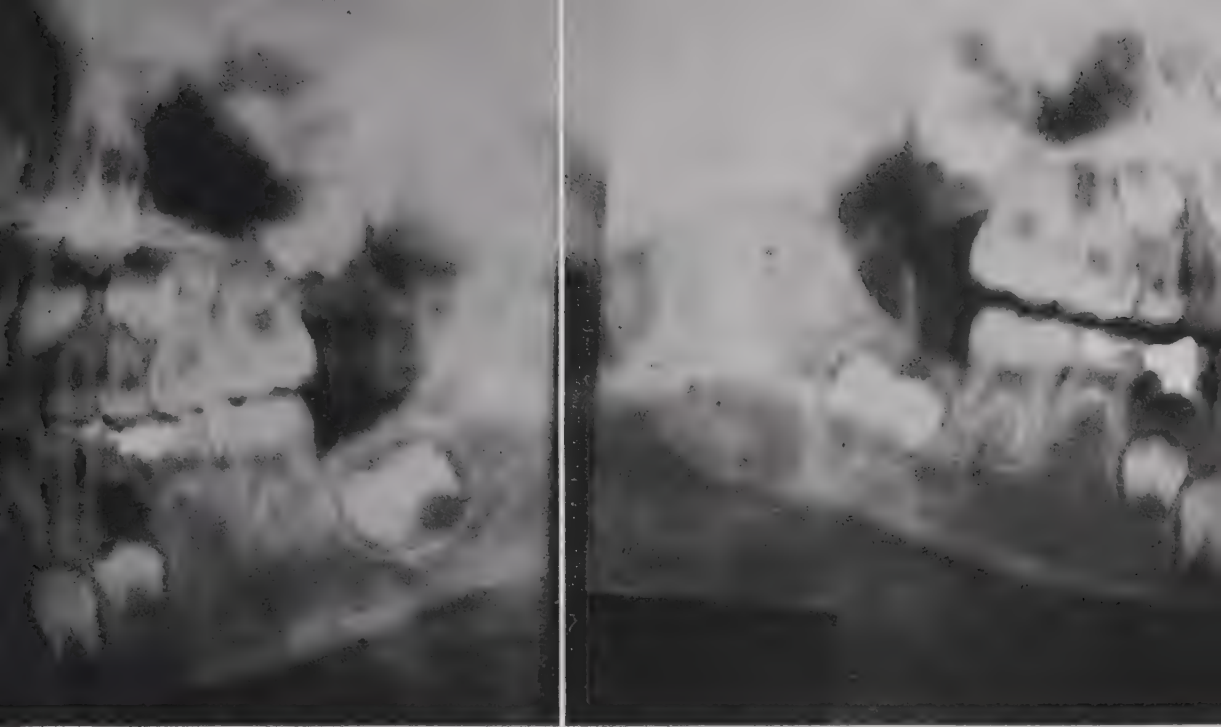
## PHYLLIS

FIGURE 573. Roentgenograms of teeth, age 78 months.



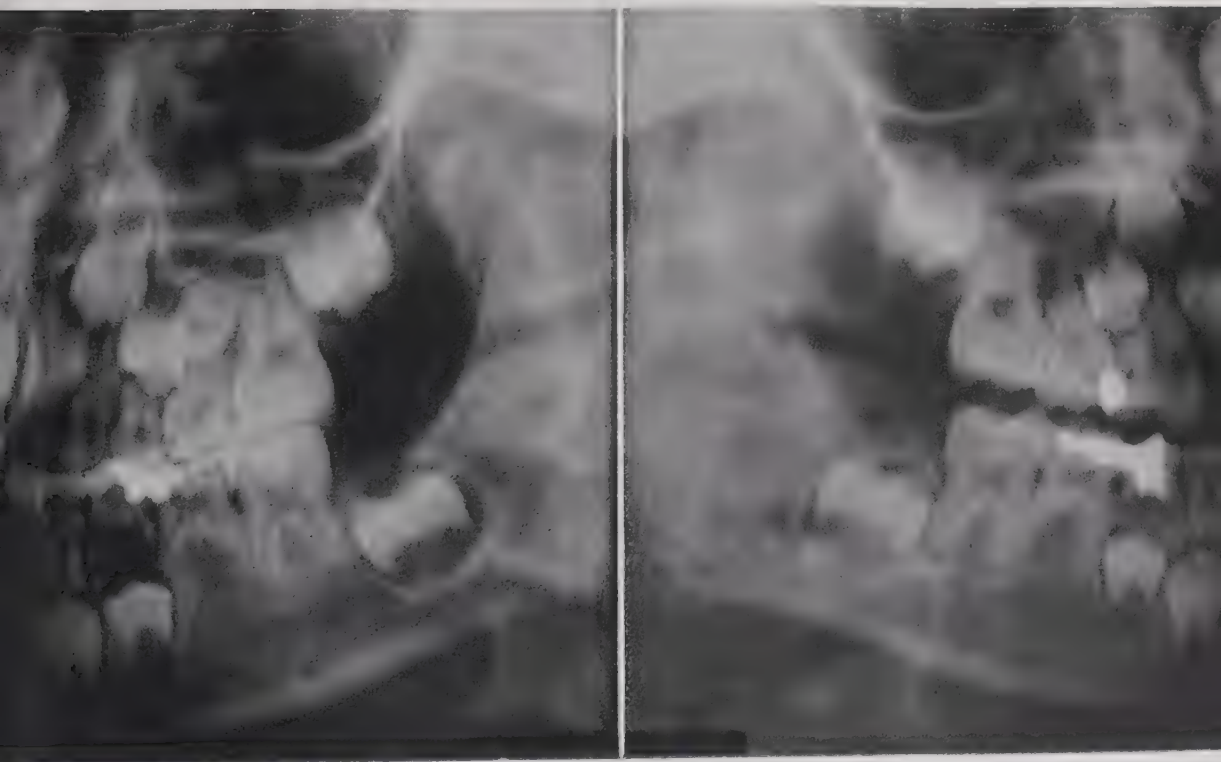
## PHYLLIS

FIGURE 574. Dental examination, age 78 months.



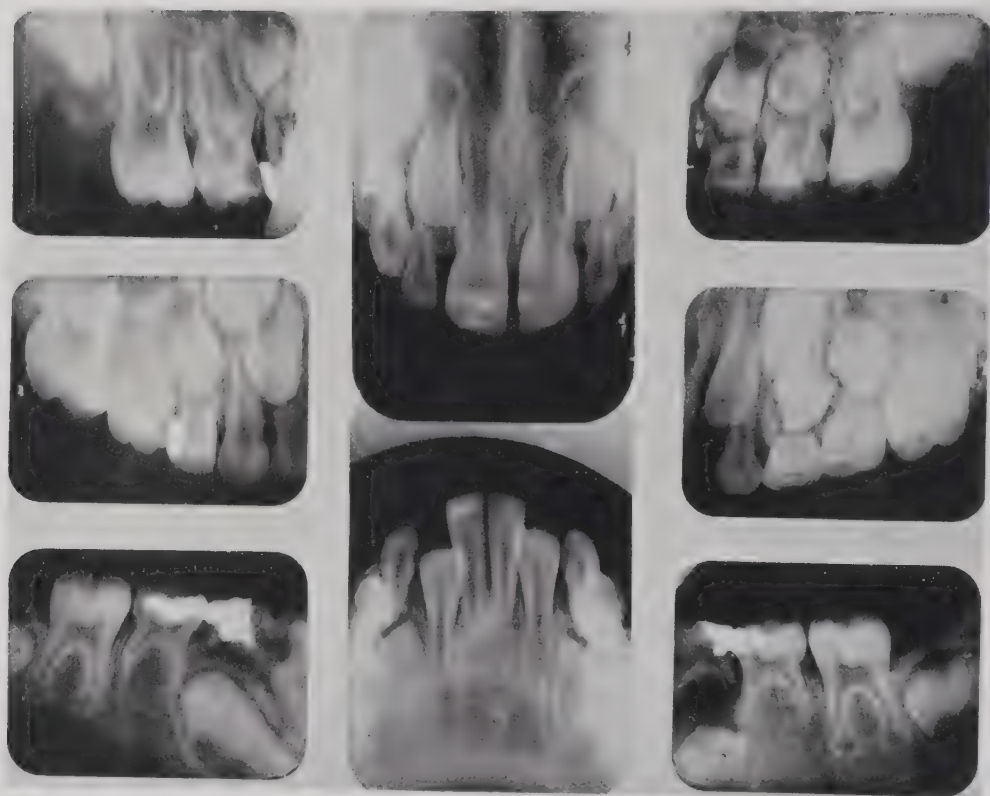
PHYLLIS

FIGURE 575. Actual size reproduction of roentgenogram of jaws.  
Chronological age 78 months.



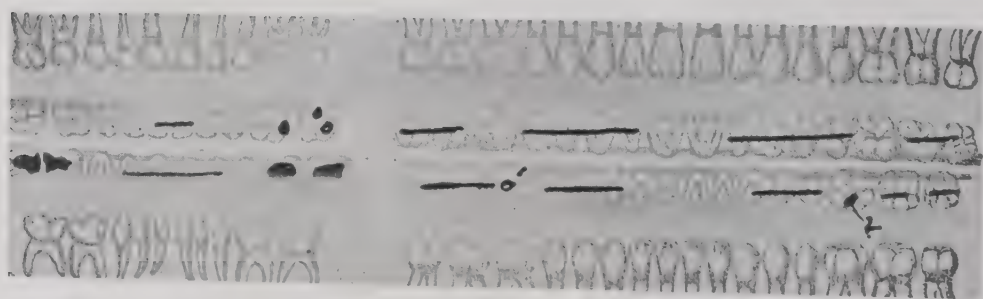
PHYLLIS

FIGURE 576. Actual size reproduction of roentgenogram of jaws.  
Chronological age 83 months.



## PHYLLIS

FIGURE 577. Roentgenograms of teeth, age 83 months.



## PHYLLIS

FIGURE 578. Dental examination, age 83 months.





## PHYLLIS

FIGURE 579. Actual size reproduction of roentgenogram of left hand.  
Chronological age 81 months.





## PHYLLIS

FIGURE 580. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 81 months.



## PHYLLIS

FIGURE 581. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 81 months.



## PHYLLIS

FIGURE 582. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 81 months.



PHYLLIS

FIGURE 583. Actual size reproduction of roentgenogram of left hip.  
Chronological age 81 months.



## PHYLLIS

FIGURE 584. Actual size reproduction of roentgenogram of left knee.  
Chronological age 81 months.





## PHYLLIS

FIGURE 585. Actual size reproduction of roentgenogram of left knee.  
Chronological age 81 months.



PHYLLIS

FIGURE 586. Actual size reproduction of roentgenogram of left foot.  
Chronological age 81 months.



PHYLLIS

FIGURE 587. Actual size reproduction of roentgenogram of left foot.  
Chronological age 81 months.



## PHYLLIS

FIGURE 588. Actual size reproduction of roentgenogram of left hand.  
Chronological age 83 months.



## PHYLLIS

FIGURE 589. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 83 months.





## PHYLLIS

FIGURE 590. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 83 months.



## PHYLLIS

FIGURE 591. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 83 months.



## PHYLLIS

FIGURE 592. Actual size reproduction of roentgenogram of left hip.  
Chronological age 83 months.



## PHYLLIS

FIGURE 593. Actual size reproduction of roentgenogram of left knee.  
Chronological age 83 months.



## PHYLLIS

FIGURE 594. Actual size reproduction of roentgenogram of left knee.  
Chronological age 83 months.





PHYLLIS

FIGURE 595. Actual size reproduction of roentgenogram of left foot.  
Chronological age 83 months.



PHYLLIS

FIGURE 596. Actual size reproduction of roentgenogram of left foot.  
Chronological age 83 months.



## PHYLLIS

FIGURE 597. Actual size reproduction of roentgenogram of left hand.  
Chronological age 97 months.



## PHYLLIS

FIGURE 598. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 97 months.



## PHYLLIS

FIGURE 599. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 97 months.





## PHYLLIS

FIGURE 600. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 97 months.



## PHYLLIS

FIGURE 601. Actual size reproduction of roentgenogram of left hip.  
Chronological age 97 months.



## PHYLLIS

FIGURE 602. Actual size reproduction of roentgenogram of left knee.  
Chronological age 97 months.



PHYLLIS

FIGURE 603. Actual size reproduction of roentgenogram of left knee.  
Chronological age 97 months.



PHYLLIS

FIGURE 604. Actual size reproduction of roentgenogram of left foot.  
Chronological age 97 months.





PHYLLIS

FIGURE 605. Actual size reproduction of roentgenogram of left foot.  
Chronological age 97 months.

## ROENTGENOGRAMS OF PROGRESS OF BARIUM MEAL

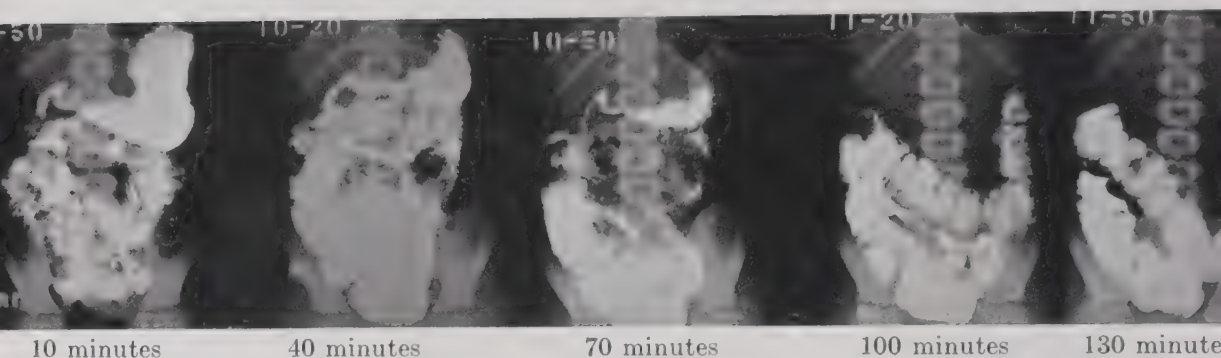


FIGURE 606. Progress of meal consisting of 2 ounces of barium sulfate and 4 ounces of water. The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

PHYLLIS

Age, 92 months

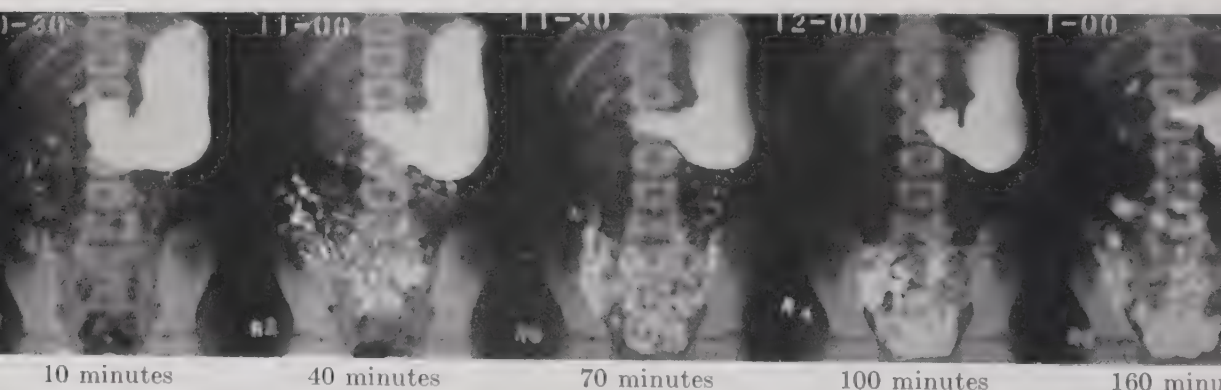
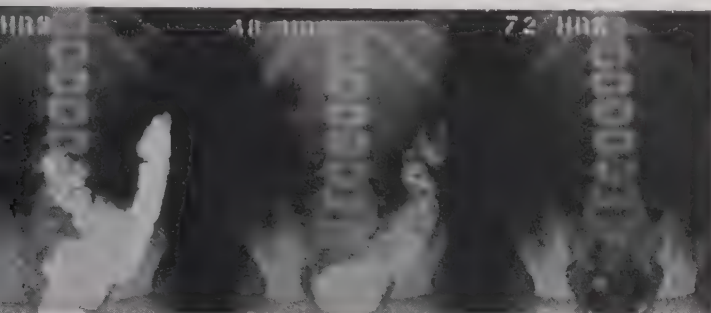


FIGURE 607. Progress of meal consisting of 40 grams of barium sulfate mixed with 100 grams of raw, ground lean meat, baked twenty to thirty minutes and ingested with 200 ml. of water. In the 290 gm. of barium, meat and water ingested (about 50 gm. of water were lost in cooking) the concentrations of fat and protein were approximately 3.5 and 7 per cent, respectively.

PHYLLIS

Age, 92 months

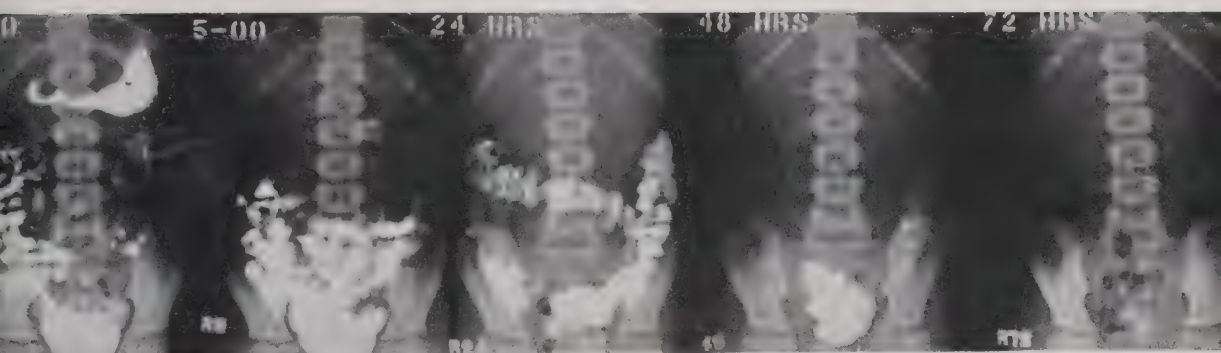
ALS THROUGH GASTROINTESTINAL TRACT



24 hours

48 hours

72 hours



340 minutes

400 minutes

24 hours

48 hours

72 hours

## BETTY

### Medical History

Betty's father was Canadian, her mother American. She weighed eight pounds at birth, following a normal delivery. Betty was breast-fed for nine months and walked at fourteen months. Betty was 67 months old when she joined the group of children participating in the second study of nutrition and chemical growth in childhood. Wassermann, Shick, Dick and Pirquet tests were negative. Throughout the study Betty's health was excellent. January 1 she was given cocillana syrup for a slight cough but dietary and collections were not interrupted.

### Psychological

At 70 months, responses to the Stanford-Binet test gave Betty a M.A. of 72 months, I.Q. 103, and on the Arthur Point Scale her M.A. was 75 months, I.Q. 107. The examiner stated:

Betty Lou is a very attractive little girl with dark hair and eyes. She talked a great deal both to herself and to examiner, was lively, happy and sang while working. She has a few infantile pronunciations, such as *w* for *r*; *th* for *s*. She was delighted with her own success and was so eager to stay longer after the examining period that it required considerable persuasion to get her out of the room. Throughout the tests she wriggled and fidgeted, sat on the table and was very active but in spite of this did not give the impression of being unduly tense or high-strung.

There were several instances in which Betty Lou approached the tests in what seemed to be an unusually intelligent way so that the examiner had the impression that she is really somewhat more intelligent than is indicated by these test results. On the other hand, there is nothing in the tests themselves to indicate that they are not a valid index of her true ability so that it remains to be seen whether these results or examiner's observations are more accurate. It is reported that this constant moving about is characteristic of Betty Lou and this also was observed by examiner in the cottage.

### Endocrinological

At 73 months of age, Betty was examined by the endocrinologist:

Gain of 2.8 inches in a period of about one year. Normal increment for this time is 2.3 inches. None of the deciduous teeth has exfoliated. None of the permanent teeth has erupted. Presents a slight but very definite subcutaneous infiltration. Rather marked dryness of the skin over the lower extremities. No structural endocrine abnormalities.

*Roentgenographic Study for Osseous Development*

Age: 5 years 8 months

Wrist (Anteroposterior)

Six carpal bones normally present. Epiphyses of the metacarpals and phalanges normally present. Distal epiphysis of the radius is present. Distal epiphysis of the ulna is just beginning to appear.

Elbow (Anteroposterior)

Head of the humerus is normally present and normally developed. Proximal epiphysis of the radius is beginning to appear. The internal condyle of the humerus, which normally appears at six is also present.

Knee (Lateral)

Distal epiphyses of the femur, tibia and fibula, and the patella, are normally present and developed.



TABLE 351

Betty

## RECUMBENT LENGTH AND WEIGHT

Age	RECUMBENT LENGTH		Weight	Age	RECUMBENT LENGTH		Weight
	Total	Stem			Total	Stem	
mo.-days	cm.	cm.	kg.	mo.-days	cm.	cm.	kg.
64-20	106.7	—	16.33	72-2	111.8	61.0	—
67-15	—	—	18.03	72-6	—	—	19.70
67-22	—	—	18.13	72-10	—	—	19.65
67-26	—	—	18.00	72-14	—	—	19.85
68-1	—	—	17.96	72-20	—	—	19.95
68-5	—	—	17.90	72-22	111.8	61.6	—
68-8	—	—	18.00	72-25	—	—	20.00
68-11	108.6	59.7	—	73-0	—	—	19.85
68-13	—	—	18.18	73-4	113.0	62.2	—
68-20	—	—	18.12	73-5	—	—	20.05
68-23	—	—	18.00	73-9	112.4	61.3	—
68-27	109.5	59.4	—	73-11	—	—	20.15
68-28	—	—	18.03	73-14	112.4	60.9	—
69-6	—	—	18.15	73-16	—	—	20.20
69-10	—	—	18.15	73-20	112.7	61.6	—
69-13	—	—	18.15	73-21	—	—	20.25
69-14	109.9	60.3	—	73-25	—	—	20.40
69-20	—	—	18.20	73-27	113.0	62.5	—
69-24	—	—	18.39	74-0	—	—	20.45
69-27	110.6	60.6	—	74-4	113.0	62.2	—
69-29	—	—	18.45	74-7	—	—	20.40
70-3	—	—	18.49	74-9	113.2	62.1	—
70-9	110.8	61.0	—	74-10	—	—	20.60
70-10	—	—	18.45	74-13	113.7	62.3	—
70-13	—	—	18.55	74-15	—	—	20.45
70-15	110.5	60.6	—	74-18	113.7	62.2	—
70-19	—	—	18.75	74-21	—	—	20.50
70-23	—	—	18.85	74-25	113.3	62.2	—
70-29	—	—	18.89	75-26	113.3	60.5	20.77
71-4	—	—	19.00	76-28	114.5	61.3	20.84
71-5	110.8	61.4	—	77-28	114.0	63.5	20.68
71-8	—	—	19.15	78-25	114.6	61.5	20.66
71-13	—	—	19.25	79-25	115.6	61.8	20.97
71-18	—	—	19.35	80-29	116.0	62.2	21.27
71-21	111.8	61.6	—	81-27	116.6	62.2	21.22
71-23	—	—	19.51	85-18	117.6	64.2	21.68
71-28	—	—	19.45	88-17	120.3	64.0	21.54

Actual values are averages of independent measurements by two workers. In calculating the smooth values given with the balance data the actual values given above were smoothed by three-point averaging and the resulting figures entered for their respective balance periods. Values for balance periods intervening between measurements were obtained by interpolation.

TABLE 352

Betty

## BLOOD DETERMINATIONS

Age	Date	Red cells	Hemo- globin*	WHITE BLOOD CELLS					
				Total	Poly- morpho- nuclears	Lym- pho- cytes	Mono- cytes	Eosino- philes	
months	mo.-day	millions	gm./100 cc.	per c. mm.	per cent	per cent	per cent	per cent	
65	7-12	4.65	12	6250	35	52	6	6	
67	10-5	4.72	14	8400	—	—	—	—	
73	3-13	4.75	14	6350	37	42	13	8	
75	5-13	3.89	12	6300	53	31	4	12	
75†	5-19	4.55	12	—	—	—	—	—	
89	7-8	4.42	12	6450	63	26	7	4	
75	5-19	Hematocrit		RED BLOOD CELL MEASUREMENTS					
				Volume	Weight	Diameter	Thickness		
		per cent		c.μ	μμg.	μ	μ		
		40		88	96	7.2	2.2		
		MINERALS (mg. per 100 ml.)							
75	5-19	SERUM					ERYTHROCYTE		
		Cal- cium	Phos- phorus	So- dium	Potas- sium	Chlor- ine	So- dium	Potas- sium	Chlor- ine
		10.6	7.58	316	15.6	371	33	490	153
		PLASMA NITROGEN AND LIPID (mg. per 100 ml.)							
		Nitro- gen	Total lipid	Phospho- lipid	Neutral fat	CHOLESTEROL			
75	5-19	1159	495	109	178	Total	Free	Esters	
						140	41	167	
75	5-19	ERYTHROCYTE NITROGEN AND LIPID (mg. per 100 gm.)							
		5335	340	191	34	112	108	8	
75	5-19	Red blood cells total solids: 35.8 per cent by weight. Specific gravity: plasma, 1.02; red cells, 1.10							

\* Haden-Hausser hemoglobinometer.

† Venous blood.

TABLE 353

Betty

BASAL METABOLISM MEASUREMENTS

Age	Date	Sur- face area*	Respi- ration	Pulse rate	Body temper- ature	Blood pres- sure	Basal metab- olism
months	mo.-day	sq.m.	per min.	per min.	°F	S D†	Cal. 24 hr.
68	11-2	0.736	15	80	98.1	70/48	958
68	11-3	0.736	16	78	98.1	70/47	1018
69	11-18	0.739	14	71	98.6	76/58	994
69	12-5	0.743	17	80	98.6	88/60	1030
70	12-18	0.752	19	80	98.0	86/60	902
70	12-30	0.753	17	90	98.6	88/58	946
70	1-5	0.755	17	78	98.2	82/60	905
71	1-25	0.763	18	72	99.0	82/54	854
72	2-10	0.775	18	76	99.0	82/50	931
72	2-21	0.777	18	76	98.8	86/60	917
73	3-12	0.784	19	76	98.2	84/62	965
73	3-24	0.790	25	76	98.2	78/52	1049
74	4-9	0.793	17	76	98.3	85/60	946
74	4-16	0.797	19	76	98.0	88/64	1010
74	4-23	0.797	15	80	98.6	90/64	1034
74	4-28	0.800	24	77	99.1	86/58	910
74	5-2	0.803	23	78	98.2	92/62	958
74	5-7	0.802	19	77	98.3	84/58	972
75	5-14	0.800	22	76	99.0	82/52	866

\* DuBois formula.  
† Systolic/Diastolic.

TABLE 354

Betty

HEIGHT AND WEIGHT RECORD\*

Age	Height	Weight	Age	Height	Weight
months	inches	pounds	months	inches	pounds
60	40 $\frac{3}{4}$	35 $\frac{3}{4}$	80	45 $\frac{3}{4}$	47 $\frac{1}{4}$
64	41 $\frac{1}{2}$	36 $\frac{1}{2}$	90	47 $\frac{1}{2}$	47 $\frac{1}{4}$
68	43 $\frac{1}{2}$	43 $\frac{3}{4}$	91	47 $\frac{1}{2}$	48 $\frac{1}{2}$
72	43 $\frac{1}{2}$	43 $\frac{3}{4}$			

\* Clinical. See also table of recumbent lengths and weights.

TABLE 355

Betty

## ANTHROPOMETRIC MEASUREMENTS

*Values in centimeters*

Age*	BREADTH			LENGTH		WIDTH	
	Biacro- mial	Intertro- chanteric	Inter- cristal	Tibia	Head	Chest	Head
68	20.2	19.3	18.4	22.1	17.3	18.1	13.4
69	21.0	18.7	17.6	22.9	17.5	17.4	13.6
70	20.0	19.6	18.0	22.7	17.4	17.6	13.6
72	20.9	19.7	18.6	23.6	17.5	18.0	13.7
73	21.4	19.5	19.0	23.3	17.3	17.8	13.7
74	21.0	20.0	18.8	23.8	17.5	18.0	13.7
75	21.8	20.8	18.8	24.0	17.5	17.8	13.8
76	22.1	20.0	18.9	23.9	17.6	18.3	13.8
77	21.8	20.0	18.5	24.4	17.6	18.2	13.7
78	22.0	20.0	18.3	25.4	17.4	18.0	13.8
79	21.4	20.0	18.5	24.5	17.3	18.3	13.7
80	21.8	20.1	19.0	24.3	17.5	18.8	13.7
81	22.7	20.3	18.8	24.5	17.5	18.6	13.7
82	23.0	20.3	19.0	24.7	17.5	18.4	13.7
86	22.7	20.7	19.0	25.2	17.5	18.5	13.8
89	22.9	20.0	19.2	26.0	17.6	18.7	13.6

Age*	DEPTH	CIRCUMFERENCES				
	Chest	Head	Chest	Thigh	Abdomen	Upper arm
68	13.6	49.8	54	31	54	15.6
69	13.8	50.0	53	30	50	16.0
70	13.0	49.6	53	31	51	15.6
72	12.5	50.0	54	32	51	16.3
73	13.0	49.5	54	32	51	16.7
74	13.2	50.0	55	33	54	17.0
75	13.0	50.2	55	33	52	17.3
76	13.4	50.0	55	32	51	16.4
77	13.0	50.7	56	32	54	16.2
78	13.0	50.0	56	32	52	16.3
79	13.0	50.0	54	32	54	16.0
80	13.3	49.5	57	32	54	16.5
81	13.0	50.0	55	32	54	16.4
82	13.9	50.0	56	33	53	16.4
86	13.0	50.0	55	33	52	16.4
89	12.7	50.0	57	32	52	16.2

\* Months.

TABLE 356

Betty  
67 months

FOOD INTAKE  
*Values in grams per day*

Food	DATE							
	9-30	11-4	12-4	1-13	2-7	3-3	3-18	3-23
	to 11-4	to 12-4	to 1-13	to 2-7	to 3-3	to 3-18	to 3-23*	to 5-12‡
Apple	100	100	200	200	200	100	100	100
Banana	100	100	—	100	100	100	100	100
Beef, lean	100	100	100	100	100	100	100	100
Bread, white	20	20	70	60	60	70	70	70
Bread, whole wheat	30	30	30	30	30	30	30	30
Butter	20	20	30	30	30	21	24	24
Cabbage	25	25	25	25	25	25	25	25
Carrot	25	25	25	25	25	25	25	25
Cheese, American	15	15	15	15	15	15	15	15
Corn flakes	15	15	15	5	5	15	15	15
Egg, whole	50	50	50	50	50	50	50	50
Graham cracker	18	18	18	18	18	18	18	18
Lettuce	20	20	20	20	20	20	20	20
Milk, fluid	400	400†	400†	400†	400	400†	400†	400†
Orange concentrate	50	50	—	—	—	—	—	—
Orange juice, fresh	—	—	—	—	—	50	50	50
Peanut butter	16	16	16	16	16	16	16	16
Potato	40	40	70	70	70	70	70	70
Salt	2	2	2	2	2	2	2	2
Shredded wheat	15	15	15	5	5	15	15	15
Spinach	—	—	—	—	—	100	—	—
Sugar (average)	4.5	2.6	4.9	7.2	6.6	10.7	5.8	8.7
Tomato juice	60	60	60	60	60	60	60	60
Water (average)	444	364	322	358	399	407	400	449

\* Oxalic acid, 0.7 gm., and calcium (as acetate) 0.058 gm., additional.  
† Irradiated.  
‡ Paroidin, 2 cc., hypodermically, April 7, 9, 12, 14, 17, 19, 22, 24.

TABLE 357

Betty  
69 months

PEDOMETER MEASUREMENTS

Date	Miles	Date	Miles	Date	Miles	Date	Miles	Date	Miles
11-16	2 <sup>1</sup> / <sub>4</sub>	12-21	1 <sup>1</sup> / <sub>16</sub>	1-19	1	3-1	1	4-11	1 <sup>1</sup> / <sub>2</sub>
11-17	2 <sup>1</sup> / <sub>4</sub>	12-22	1	1-25	2 <sup>1</sup> / <sub>4</sub>	3-7	2 <sup>1</sup> / <sub>4</sub>	4-12	1 <sup>1</sup> / <sub>2</sub>
11-23	2 <sup>1</sup> / <sub>16</sub>	12-28	2 <sup>1</sup> / <sub>4</sub>	1-26	2 <sup>1</sup> / <sub>4</sub>	3-8	2 <sup>1</sup> / <sub>4</sub>	4-18	1 <sup>1</sup> / <sub>2</sub>
11-24	3 <sup>1</sup> / <sub>16</sub>	12-29	2 <sup>1</sup> / <sub>4</sub>	2-1	2 <sup>1</sup> / <sub>4</sub>	3-14	1 <sup>1</sup> / <sub>16</sub>	4-19	2 <sup>1</sup> / <sub>2</sub>
11-30	2 <sup>1</sup> / <sub>4</sub>	1-4	1 <sup>1</sup> / <sub>16</sub>	2-2	1 <sup>1</sup> / <sub>4</sub>	3-22	1 <sup>1</sup> / <sub>2</sub>	4-25	1 <sup>1</sup> / <sub>2</sub>
12-1	2 <sup>1</sup> / <sub>16</sub>	1-5	1	2-8	1 <sup>1</sup> / <sub>16</sub>	3-28	1	4-26	1 <sup>1</sup> / <sub>2</sub>
12-7	2 <sup>1</sup> / <sub>16</sub>	1-11	1 <sup>1</sup> / <sub>16</sub>	2-9	1 <sup>1</sup> / <sub>16</sub>	3-29	1 <sup>1</sup> / <sub>2</sub>	5-2	1 <sup>1</sup> / <sub>2</sub>
12-8	2 <sup>1</sup> / <sub>4</sub>	1-12	1 <sup>1</sup> / <sub>4</sub>	2-15	2 <sup>1</sup> / <sub>16</sub>	4-4	1 <sup>1</sup> / <sub>2</sub>	5-3	1 <sup>1</sup> / <sub>2</sub>
12-14	1 <sup>1</sup> / <sub>4</sub>	1-18	1 <sup>1</sup> / <sub>16</sub>	2-16	2 <sup>1</sup> / <sub>16</sub>	4-5	1 <sup>1</sup> / <sub>4</sub>	5-9	1 <sup>1</sup> / <sub>2</sub>
12-15	1 <sup>1</sup> / <sub>4</sub>			2-29	2 <sup>1</sup> / <sub>4</sub>			5-10	1 <sup>1</sup> / <sub>2</sub>

New Haven pedometers were set at 24 inches and worn hooked to belt during hours awake.



TABLE 358

Betty  
67 months

## BODY LENGTH AND WEIGHT—INTAKE AND ELIMINATION

Date	Recumbent length*	Weight*	INTAKE			AVERAGE DAILY HEAT OF COMBUSTION			FECES				
			AVERAGE DAILY			In-take	Urine	Feces	AVERAGE DAILY			Laxation rate†	Elimination time‡
			Dry wt.‡	Total water†	Fat				Wet wt.	Dry wt.‡	Fat		
mo.-day	cm.	kg.	gm.	gm.	gm.	Cal.	Cal.	Cal.	gm.	gm.	gm.		hours
9-30	108	18.07	315	1284	57.5	1623	54	54	104.0	16.2	2.2	1.0	35
10-5	108	18.06	313	1283	57.5	1614	—	63	114.0	12.5	1.4	1.4	29
10-10	108	18.05	314	1348	57.5	1618	61	60	147.8	16.0	1.7	2.2	10
10-15	108	18.03	319	1187	57.5	1638	58	89	143.0	19.0	1.8	2.8	11
10-20	109	17.95	313	1208	57.5	1615	50	63	95.8	16.0	1.8	2.0	27
10-25	109	17.95	312	1289	57.5	1611	65	57	81.0	14.0	1.8	1.6	11
10-30	109	18.03	315	1203	57.5	1623	60	75	85.4	19.0	2.6	2.2	25
11-4	109	18.10	310	1135	59.7	1619	79	63	83.2	12.0	1.8	1.6	29
11-9	109	18.10	309	1134	59.7	1613	58	59	114.2	13.0	1.6	1.6	26
11-14	109	18.05	308	1195	59.7	1608	62	61	100.8	15.0	1.8	1.8	32
11-19	110	18.06	309	1176	59.7	1612	64	67	102.0	13.0	1.7	1.6	12
11-24	110	18.11	310	1222	59.7	1618	61	63	86.0	17.0	2.4	2.2	11
11-29	110	18.15	307	1224	59.7	1604	60	59	76.2	11.0	1.4	1.4	29
12-4	110	18.17	322	1111	74.0	1736	79	78	107.4	13.0	1.8	2.2	5
12-9	110	18.25	322	1125	74.0	1737	69	67	86.0	13.0	2.1	1.2	30
12-14	110	18.35	325	1142	74.0	1750	60	63	102.4	12.0	1.8	1.4	26
12-19	110	18.44	322	1142	74.0	1737	78	79	112.0	14.0	1.9	2.2	25
12-24	111	18.46	334	1162	74.0	1783	58	71	106.8	15.0	1.9	1.4	34
12-29	111	18.50	328	1192	74.0	1761	56	69	119.6	15.0	1.9	2.0	30
1-3	111	18.58	324	1185	74.0	1744	57	74	118.6	15.0	1.8	2.0	11
1-8	111	18.72	327	1252	74.0	1757	—	91	107.8	22.0	2.9	2.0	9
1-13	111	18.83	334	1270	73.5	1757	—	72	78.4	16.0	2.4	1.8	12
1-18	111	18.91	337	1262	73.5	1769	68	74	78.0	19.0	2.5	1.4	30
1-23	111	19.01	334	1308	73.5	1756	65	78	99.6	15.0	2.0	1.4	35
1-28	111	19.13	336	1273	73.5	1767	62	75	95.0	18.0	2.3	1.6	7
2-2	111	19.25	339	1198	73.5	1779	62	59	79.6	12.0	1.8	2.0	30
2-7	111	19.37	333	1275	73.5	1757	62	79	92.0	18.0	2.6	1.8	32
2-12	112	19.44	337	1283	73.5	1776	62	80	108.2	18.0	2.3	1.8	30
2-17	112	19.55	332	1305	73.5	1756	66	71	101.4	14.0	2.1	2.0	11
2-22	112	19.60	333	1354	73.5	1758	56	93	112.4	20.0	2.6	1.8	12
2-27	112	19.73	336	1305	73.5	1770	66	78	108.0	16.0	2.2	1.4	30
3-3	112	19.82	358	1373	68.0	1760	68	88	83.6	20.0	2.5	1.0	49
3-8	112	19.93	364	1353	68.0	1783	63	90	85.6	23.0	2.7	1.2	30
3-13	112	19.93	363	1353	68.0	1781	76	88	105.0	18.0	2.4	1.8	11
3-18	112	19.97	340	1272	68.5	1758	50	70	101.0	22.0	2.7	2.2	11
3-23	112	20.02	334	1207	68.5	1767	75	84	105.4	20.0	2.8	2.0	25
3-28	113	20.13	331	1317	68.5	1754	66	78	81.8	17.0	2.4	1.4	30
4-2	113	20.20	336	1259	68.5	1773	67	77	91.4	19.0	2.5	1.4	34
4-7	113	20.28	332	1263	68.5	1759	66	72	114.2	15.0	1.9	1.4	10
4-12	113	20.37	337	1281	68.5	1779	87	76	95.0	20.0	2.4	1.6	12
4-17	113	20.42	337	1321	68.5	1778	65	108	98.8	23.0	3.2	1.6	26
4-22	113	20.48	331	1291	68.5	1754	63	108	104.8	22.0	3.1	1.8	30
4-27	113	20.48	333	1371	68.5	1761	65	90	96.0	18.0	2.6	1.8	11
5-2	114	20.52	340	1247	68.5	1790	65	122	163.8	25.0	2.6	2.0	10
5-7	114	20.48	338	1741	68.5	1782	70	79	82.0	15.0	2.0	1.4	10

The age given is the initial age at start of study. Dates given are first days of five-day balance periods. Italic figures were omitted from calculations of the averages given in Volume I.

\* See Table 351 for actual values and method of smoothing.

‡ Based on alcohol-dried food and oven-dried feces.

† Drinking water plus water in foods.

‡ Average number of defecations per day.

§ Elapsed time between ingestion and defecation of marker used to separate feces of five-day periods.

TABLE 359

Betty  
67 months

## NITROGEN AND NEGATIVE MINERALS IN INTAKE, URINE, FECES

*Values are averages per day*

Date	NITROGEN			PHOSPHORUS			CHLORINE			SULFUR		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
9-30	9.45	7.59	1.28	996	584	202	3031	2684	30	612	485	29
10-5	9.45	7.75	1.24	996	628	290	3031	2622	19	612	491	72
10-10	9.45	8.02	1.12	996	632	254	3031	2702	33	612	527	70
10-15	9.45	7.47	1.13	996	588	344	3031	2658	47	612	540	102
10-20	9.45	8.24	0.86	996	707	274	3031	2825	22	612	546	67
10-25	9.45	8.57	0.76	996	619	255	3031	2839	18	612	590	59
10-30	9.45	8.50	0.89	996	688	352	3031	2814	17	612	566	76
11-4	9.45	8.09	0.79	996	620	261	3031	2718	69	612	543	60
11-9	9.45	8.24	0.96	996	585	258	3031	2790	78	612	536	64
11-14	9.45	7.97	1.01	996	560	248	3031	2694	54	612	530	61
11-19	9.45	8.28	0.92	996	588	262	3031	2820	40	612	545	72
11-24	9.45	8.68	0.90	996	575	304	3031	2786	79	612	558	64
11-29	9.45	8.19	0.89	996	560	288	3031	2764	66	612	532	57
12-4	10.28	8.49	1.14	1059	545	300	3300	3120	69	686	550	79
12-9	10.28	9.06	1.03	1059	664	277	3300	3182	49	686	580	65
12-14	10.28	8.91	1.09	1059	631	247	3300	3000	54	686	584	62
12-19	10.28	9.66	1.12	1059	676	309	3300	3300	84	686	620	72
12-24	10.28	8.41	1.05	1059	563	299	3300	3114	82	686	548	70
12-29	10.28	8.48	1.12	1059	521	301	3300	2880	76	686	553	72
1-3	10.28	8.80	1.08	1059	562	320	3300	2820	76	686	585	76
1-8	10.28	8.62	1.15	1059	581	434	3300	2920	72	686	560	90
1-13	10.02	8.10	0.93	1032	571	313	3305	3040	88	663	527	66
1-18	10.02	8.52	0.93	1032	597	341	3305	3040	104	663	553	68
1-23	10.02	8.22	1.03	1032	562	289	3305	2838	86	663	533	79
1-28	10.02	8.17	1.04	1032	640	303	3305	3156	75	663	538	69
2-2	10.02	8.12	0.96	1032	602	243	3305	3048	48	663	532	57
2-7	10.02	8.45	1.06	1032	651	315	3305	2832	40	663	560	77
2-12	10.02	8.25	1.12	1032	633	295	3305	2850	41	663	530	80
2-17	10.02	8.04	1.07	1032	607	257	3305	2958	34	663	530	70
2-22	10.02	8.15	1.11	1032	632	336	3305	2772	49	663	532	96
2-27	10.02	8.81	1.11	1032	681	280	3305	3089	47	663	565	80
3-3	10.68	8.68	1.05	1175	680	373	3955	3687	49	726	582	89
3-8	10.68	8.80	1.03	1175	704	354	3955	3792	65	726	608	106
3-13	10.68	8.97	1.30	1175	651	341	3955	3720	47	726	593	101
3-18	10.39	8.61	1.08	1088	707	316	3418	3293	54	698	578	91
3-23	10.39	8.50	1.05	1088	699	335	3418	3204	81	698	578	74
3-28	10.39	8.36	1.01	1088	620	311	3418	3300	58	698	572	74
4-2	10.39	8.48	1.10	1088	639	303	3418	3407	93	698	547	77
4-7	10.39	8.61	1.15	1088	621	296	3418	3240	88	698	546	75
4-12	10.39	8.70	1.07	1088	724	284	3418	3180	87	698	565	77
4-17	10.39	8.74	1.28	1088	703	394	3418	3176	85	698	563	107
4-22	10.39	8.33	1.26	1088	617	390	3418	3300	137	698	534	102
4-27	10.39	8.58	1.27	1088	650	317	3418	3108	81	698	560	94
5-2	10.39	8.44	1.46	1088	642	354	3418	3492	151	698	537	123
5-7	10.39	8.66	1.06	1088	698	293	3418	3138	70	698	542	82

TABLE 360

Betty  
67 months

## POSITIVE MINERALS IN INTAKE, URINE, FECES

*Values are averages per day*

Date	CALCIUM			MAGNESIUM			SODIUM			POTASSIUM		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
9-30	722	103	462	248	71	126	1876	1735	58	2252	1622	623
10-5	722	75	686	248	71	165	1876	1746	18	2252	1662	409
10-10	722	70	564	248	69	159	1876	1609	72	2252	1669	427
10-15	722	67	503	248	62	158	1876	1724	62	2252	1750	418
10-20	722	56	537	248	77	156	1876	1764	12	2252	1733	333
10-25	722	73	429	248	83	117	1876	1917	13	2252	1794	275
10-30	722	71	559	248	79	151	1876	1669	16	2252	1860	288
11-4	722	63	498	248	82	133	1876	1775	00	2252	1780	280
11-9	722	60	549	248	77	152	1876	1707	66	2252	1730	346
11-14	722	64	529	248	75	156	1876	1656	27	2252	1760	335
11-19	722	56	518	248	71	145	1876	1732	32	2252	1862	293
11-24	722	65	550	248	92	144	1876	1760	17	2252	1936	278
11-29	722	58	522	248	89	135	1876	1778	00	2252	1466	373
12-4	763	78	531	237	91	134	2173	2070	33	2146	1633	355
12-9	763	67	538	237	91	133	2173	2070	14	2146	1591	331
12-14	763	70	550	237	77	132	2173	2008	41	2146	1645	373
12-19	763	82	526	237	99	134	2173	2192	43	2146	1690	381
12-24	763	67	547	237	89	130	2173	1993	25	2146	1758	385
12-29	763	52	616	237	80	149	2173	1892	27	2146	1660	402
1-3	763	45	587	237	105	144	2173	1955	52	2146	1670	443
1-8	763	63	642	237	98	151	2173	1985	43	2146	1476	350
1-13	753	60	555	260	116	137	2059	1980	14	2469	2063	402
1-18	753	74	561	260	131	137	2059	2008	00	2469	1990	299
1-23	753	74	529	260	92	127	2059	1885	21	2469	1812	377
1-28	753	90	563	260	83	149	2059	2054	25	2469	1958	367
2-2	753	73	535	260	79	134	2059	1985	00	2469	1950	332
2-7	753	70	548	260	88	132	2059	1895	20	2469	1984	342
2-12	753	67	578	260	88	140	2059	1913	47	2469	1743	364
2-17	753	64	559	260	78	136	2059	1901	45	2469	1862	342
2-22	753	56	581	260	83	148	2059	1864	48	2469	1882	386
2-27	753	52	573	260	90	147	2059	2012	34	2469	1931	414
3-3	825	56	616	336	92	192	2545	2425	29	2785	2012	292
3-8	825	56	550	336	94	187	2545	2448	34	2785	2236	306
3-13	825	50	664	336	99	231	2545	2394	28	2785	2278	386
3-18	832	47	615	282	88	165	2169	2338	42	2676	2054	345
3-23	775	53	532	282	86	156	2169	1980	51	2676	2031	359
3-28	775	52	511	282	91	148	2169	2046	00	2676	2000	327
4-2	775	55	517	282	89	152	2169	2174	26	2676	2002	366
4-7	775	63	572	282	89	158	2169	2035	53	2676	1962	385
4-12	775	101	498	282	95	144	2169	1951	50	2676	1894	287
4-17	775	113	538	282	94	171	2169	2019	32	2676	2073	346
4-22	775	101	475	282	83	149	2169	1982	56	2676	2023	359
4-27	775	121	499	282	84	163	2169	1944	31	2676	1999	353
5-2	775	73	491	282	81	156	2169	1914	142	2676	2030	381
5-7	775	42	473	282	89	152	2169	1964	23	2676	1889	248



TABLE 361

Betty  
67 months

## COMPLEX CARBOHYDRATES IN INTAKE AND FECES

*Values in grams per day*

Date	LIGNIN		CELLULOSE		HEMICELLULOSE		
	Intake	Feces	Intake	Feces	INTAKE		Feces
					Total	Stable	
9-30	1.28	1.31	2.08	1.75	2.17	1.72	1.22
10-5	1.28	0.86	2.08	1.14	2.17	1.72	0.84
10-10	1.28	1.31	2.08	1.32	2.17	1.72	1.12
10-15	1.28	1.40	2.08	1.92	2.17	1.72	1.24
10-20	1.28	1.43	2.08	1.32	2.17	1.72	1.26
10-25	1.28	1.12	2.08	1.04	2.17	1.72	1.06
10-30	1.28	1.88	2.08	1.37	2.17	1.72	1.29
11-4	1.28	1.17	2.08	0.76	2.17	1.72	0.87
11-9	1.28	1.15	2.08	0.96	2.17	1.72	0.96
11-14	1.28	1.15	2.08	0.82	2.17	1.72	1.14
11-19	1.24	1.50	2.03	0.72	1.99	1.52	0.94
11-24	1.31	1.29	2.14	0.92	2.35	1.93	1.18
11-29	1.24	1.04	2.03	0.59	1.99	1.52	0.76
12-4	1.07	0.88	2.55	0.94	2.51	1.93	0.93
12-9	1.07	0.84	2.55	0.93	2.51	1.93	0.91
12-14	1.07	0.69	2.55	0.56	2.51	1.93	0.88
12-19	1.07	0.88	2.55	0.83	2.51	1.93	0.77
12-24	1.07	1.15	2.55	1.21	2.51	1.93	0.99
12-29	1.07	1.31	2.55	1.10	2.51	1.93	1.06
1-3	1.07	1.12	2.55	1.15	2.51	1.93	1.09
1-8	1.07	2.28	2.55	1.19	2.51	1.93	1.28
1-13	1.41	1.30	2.50	1.04	2.16	1.63	1.12
1-18	1.40	2.14	2.48	1.08	2.10	1.56	1.03
1-23	1.41	1.58	2.50	0.68	2.16	1.63	0.81
1-28	1.41	1.78	2.50	0.64	2.16	1.63	0.94
2-2	1.41	1.20	2.50	0.60	2.16	1.63	0.61
2-7	1.41	1.65	2.50	1.00	2.16	1.63	0.91
2-12	1.41	1.56	2.50	1.34	2.16	1.63	0.89
2-17	1.41	1.24	2.50	0.68	2.16	1.63	0.80
2-22	1.41	1.73	2.50	1.20	2.16	1.63	1.20
2-27	1.41	1.81	2.50	0.58	2.16	1.63	0.82
3-3	1.46	1.74	2.61	0.93	2.61	1.98	1.27
3-8	1.46	2.30	2.61	1.19	2.61	1.98	1.50
3-13	1.46	1.63	2.61	0.84	2.61	1.98	1.13
3-18	1.33	1.71	2.32	1.16	2.47	1.89	1.36
3-23	1.33	1.82	2.32	1.14	2.47	1.89	1.33
3-28	1.36	1.55	2.37	0.95	2.65	2.09	1.14
4-2	1.33	1.61	2.32	0.96	2.47	1.89	1.26
4-7	1.33	1.30	2.32	0.94	2.47	1.89	0.98
4-12	1.33	1.86	2.32	1.32	2.47	1.89	1.35
4-17	1.33	2.40	2.32	0.88	2.47	1.89	1.45
4-22	1.33	1.58	2.32	1.54	2.47	1.89	1.09
4-27	1.33	1.80	2.32	0.55	2.47	1.89	1.04
5-2	1.33	1.84	2.32	1.93	2.47	1.89	1.70
5-7	1.33	1.27	2.32	1.06	2.47	1.89	0.99

TABLE 362

Betty  
73 months

## NITROGEN PARTITION OF URINE

*Values in grams of nitrogen per day*

Date	Total nitrogen	Urea	Ammonia	Creatinine +Creatine	Creatinine	Uric acid
3-28	7.86	7.105	0.275	0.258	0.151	0.131
3-29	8.74	7.862	0.278	0.341	0.199	0.132
3-30	8.34	7.559	0.301	0.368	0.156	0.085
3-31	7.69	7.130	0.310	0.323	0.156	0.137
4-1	9.19	8.115	0.325	0.364	0.171	0.133
4-2	8.04	6.741	0.239	0.289	0.144	0.132
4-3	8.92	7.938	0.302	0.335	0.149	0.131
4-4	8.00	6.854	0.226	0.289	0.139	0.118
4-5	8.66	7.303	0.277	0.332	0.167	0.151
4-6	8.78	7.598	0.298	0.331	0.158	0.143
4-7	8.14	7.184	0.276	0.285	0.151	0.130
4-9	8.65	7.736	0.294	0.314	0.156	0.134
4-10	9.24	7.998	0.322	0.385	0.167	0.130
4-11	8.41	7.183	0.277	0.328	0.147	0.130
4-12	9.74	8.422	0.318	0.422	0.199	0.157
4-13	8.09	7.038	0.342	0.367	0.170	0.101
4-14	8.72	7.546	0.274	0.354	0.182	0.140
4-15	8.31	7.253	0.287	0.323	0.156	0.118
4-16	8.65	7.001	0.271	0.377	0.170	0.139
4-17	9.20	8.200	0.284	0.385	0.182	0.155
4-18	8.61	7.690	0.294	0.334	0.190	0.125
4-19	9.00	8.010	0.274	0.333	0.166	0.140
4-20	8.24	7.469	0.321	0.290	0.179	0.114
4-21	8.63	7.703	0.289	0.281	0.151	0.146
4-22	8.13	7.230	0.314	0.286	0.156	0.135
4-23	8.18	7.339	0.265	0.268	0.184	0.136
4-24	8.77	7.794	0.312	0.274	0.190	0.132
4-25	7.96	7.018	0.330	0.290	0.156	0.130
4-26	8.63	7.700	0.324	0.295	0.184	0.134
4-27	9.08	8.048	0.299	0.339	0.172	0.140
4-28	8.52	7.510	0.316	0.352	0.190	0.126
4-29	8.61	7.621	0.231	0.305	0.153	0.131
4-30	8.32	7.351	0.267	0.334	0.167	0.111
5-1	8.39	7.337	0.275	0.295	0.179	0.136
5-2	8.71	7.642	0.276	0.301	0.179	0.133
5-3	8.21	7.354	0.330	0.292	0.162	0.139
5-4	8.47	7.659	0.337	0.297	0.167	0.141
5-5	5.78	5.171	0.167	0.222	0.134	0.098
5-6	11.01	9.726	0.464	0.375	0.203	0.150
5-7	8.78	7.754	0.362	0.273	0.162	0.143
5-8	8.62	7.533	0.325	0.321	0.210	0.150
5-9	8.34	7.402	0.326	0.242	0.186	0.128
5-10	8.85	7.751	0.315	0.374	0.212	0.145
5-11	8.71	7.713	0.351	0.275	0.171	0.129

The age given is the initial age at start of study.



TABLE 363

Betty  
73 months

TEMPERATURE AND PULSE

Date	Temper- ature	Pulse	Date	Temper- ature	Pulse	Date	Temper- ature	Pulse
4-7	98.4	68	4-19	98.6	80	5-2	98.2	78
4-8	98.2	68	4-20	98.2	74	5-3	98.2	76
4-9	98.3	75	4-21	98.2	73	5-4	98.6	76
4-10	98.6	76	4-22	98.2	79	5-5	98.2	76
4-11	98.6	80	4-23	98.6	80	5-6	98.2	84
4-12	98.2	75	4-24	98.2	84	5-7	98.3	76
			4-25	98.7	80			
4-13	98.6	76	4-26	98.4	92	5-8	98.4	81
4-14	98.6	80	4-27	98.6	82	5-9	98.3	88
4-15	98.2	76	4-28	99.1	76	5-10	98.6	76
4-16	98.0	76	4-29	99.3	80	5-11	98.6	92
4-17	98.6	72	4-30	98.2	80	5-12	98.4	84
4-18	98.4	72	5-1	98.4	88	5-13	98.6	80

TABLE 364

Betty  
67 months

IRON IN INTAKE, URINE AND FECES  
*Values are averages per day*

Date	Intake	Urine	Feces	Date	Intake	Urine	Feces	Date	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mo.-day	mg.	mg.	mg.	mo.-day	mg.	mg.	mg.
9-30	7.39	0.18	7.10	12-14	7.96	0.15	5.25	2-27	7.79	0.05	5.08
10-5	7.39	0.04	3.98	12-19	7.96	0.31	5.78	3-3	9.18	0.04	8.42
10-10	7.39	0.21	4.92	12-24	7.96	0.27	6.22	3-8	9.18	0.11	8.51
10-15	7.39	0.19	6.10	12-29	7.96	0.20	5.92	3-13	9.18	0.64	11.59
10-20	7.39	0.13	6.80	1-3	7.96	0.04	5.96	3-18	8.20	0.29	15.68
10-25	7.39	0.06	6.16	1-8	7.96	0.28	9.27	3-23	8.20	0.02	14.25
10-30	7.39	0.26	8.36	1-13	7.80	0.18	6.40	3-28	8.20	0.02	12.45
11-4	7.40	0.02	5.07	1-18	7.80	0.17	7.17	4-2	8.20	0.03	61.20
11-9	7.40	0.16	4.66	1-23	7.80	0.23	5.02	4-7	8.20	0.00	5.91
11-14	7.40	0.21	5.40	1-28	7.80	0.00	6.12	4-12	8.20	0.04	7.65
11-19	7.40	0.10	6.30	2-2	7.80	0.12	4.11	4-17	8.20	0.04	10.78
11-24	7.40	0.04	4.24	2-7	7.79	0.28	5.49	4-22	8.20	0.35	7.32
11-29	7.40	0.52	6.35	2-12	7.79	0.27	5.44	4-27	8.20	0.07	10.80
12-4	7.96	0.36	4.71	2-17	7.79	0.02	4.54	5-2	8.20	0.11	9.88
12-9	7.96	0.34	5.72	2-22	7.79	0.01	6.65	5-7	8.20	0.25	6.38

The age given is the initial age at start of study. Dates given are first days of five-day balances period.

TABLE 365

Betty

## MEASUREMENTS OF THE BONES OF THE WRIST

AGE, months	65	67	73	75	89
<b>CARPALS</b>					
AREA, sq. mm.					
Hamate	76	80	88	91	109
Capitate	119	127	140	146	170
Lesser Multangular	15	16	25	28	44
Greater Multangular	12	16	24	28	44
Navicular	16	21	33	37	53
Lunate	35	37	47	50	68
Triangular	34	37	40	44	54
<b>GREATEST DIAMETER, mm.</b>					
Hamate	12	12	13	13	14
Capitate	15	16	16	17	18
Lesser Multangular	4	5	6	6	9
Greater Multangular	5	6	6	8	9
Navicular	5	6	8	8	10
Lunate	8	9	9	9	10
Triangular	8	8	9	9	10
<b>Epiphyses</b>					
1st Metacarpal	7	8	8	8	8
2nd Metacarpal	10	10	11	11	11
3rd Metacarpal	8	9	10	10	10
4th Metacarpal	7	7	8	8	8
<b>ULNA</b>					
DIAMETER, mm.					
Distal epiphysis	3	3	5	6	10
Distal metaphysis	11	11	12	11	13
<b>RADIUS</b>					
DIAMETER, mm.					
Distal epiphysis	18	18	19	19	21
WRIST AREA, * sq. mm.	948	934	1006	994	1114

\* Measured with the planimeter using Flory's landmarks (Monographs of the Society for Research in Child Development, Vol. I, No. 3, 1936).

TABLE 366

Betty

## SKELETAL MATURATION

*Values in months*

Chrono- logical age	HAND			FOOT	ELBOW	KNEE	HIP	SHOULDER	AVERAGE
	B.B.G.*	Flory†	Todd‡	Todd‡	Todd‡	Todd‡	Todd‡	Todd‡	Todd‡
65	68	50	70	64	66	60	68	60	64
67	69	57	75	68	68	62	69	63	68
73	77	61	81	76	72	67	72	70	74
75	83	66	83	78	75	69	75	75	76
89	104	74	93	81	76	79	81	87	83

\* Baldwin, B. T., Busby, L. M., Garside, H. V. Anatomic growth of children. University of Iowa Studies in Child Welfare, vol. 4, no. 1, 1928.

† Flory, C. D. Osseous development in the hand as an index of skeletal development. Monographs of the Society for Research in Child Development, vol. 1, no. 3, 1936.

‡ Determined by T. Wingate Todd, C. C. Francis, and Idell Pyle, Western Reserve University, Cleveland.

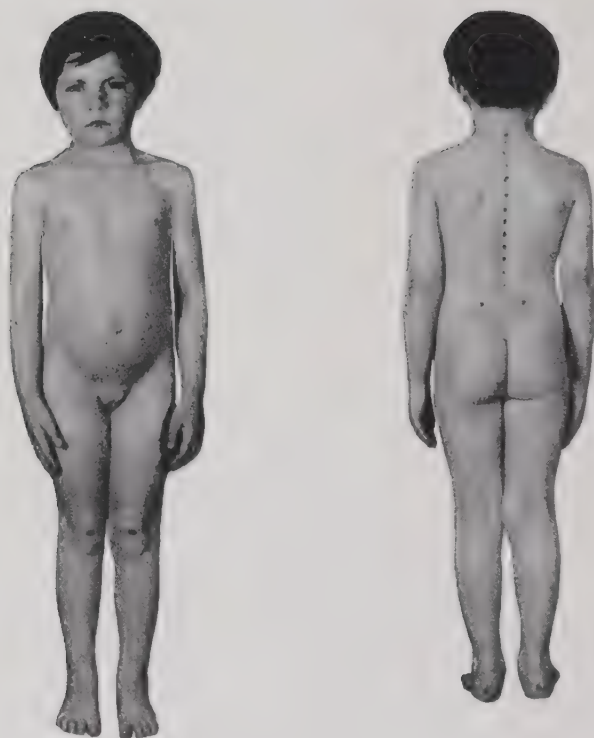


FIGURE 608. BETTY, age 70 months.



BETTY

FIGURE 609. Actual size reproduction of roentgenogram of left hand.  
Chronological age 65 months.



BETTY

FIGURE 610. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 65 months.





BETTY

FIGURE 611. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 65 months.



BETTY

FIGURE 612. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 65 months.



## BETTY

FIGURE 613. Actual size reproduction of roentgenogram of left hip.  
Chronological age 65 months.



## BETTY

FIGURE 614. Actual size reproduction of roentgenogram of left knee.  
Chronological age 65 months.



BETTY

FIGURE 615. Actual size reproduction of roentgenogram of left knee.  
Chronological age 65 months.





BETTY

FIGURE 616. Actual size reproduction of roentgenogram of left foot.  
Chronological age 65 months.



BETTY

FIGURE 617. Actual size reproduction of roentgenogram of left foot.  
Chronological age 65 months.



BETTY

FIGURE 618. Actual size reproduction of roentgenogram of left hand.  
Chronological age 67 months.



BETTY

FIGURE 619. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 67 months.



BETTY

FIGURE 620. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 67 months.





## BETTY

FIGURE 621. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 67 months.



BETTY

FIGURE 622. Actual size reproduction of roentgenogram of left hip.  
Chronological age 67 months.



BETTY

FIGURE 623. Actual size reproduction of roentgenogram of left knee.  
Chronological age 67 months.



BETTY

FIGURE 624. Actual size reproduction of roentgenogram of left knee  
Chronological age 67 months.



BETTY

FIGURE 625. Actual size reproduction of roentgenogram of left foot.  
Chronological age 67 months.





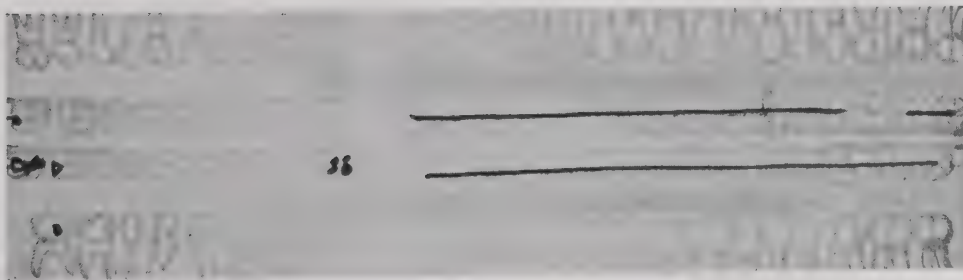
BETTY

FIGURE 626. Actual size reproduction of roentgenogram of left foot.  
Chronological age 67 months.



BETTY

FIGURE 627. Roentgenograms of teeth, age 69 months.



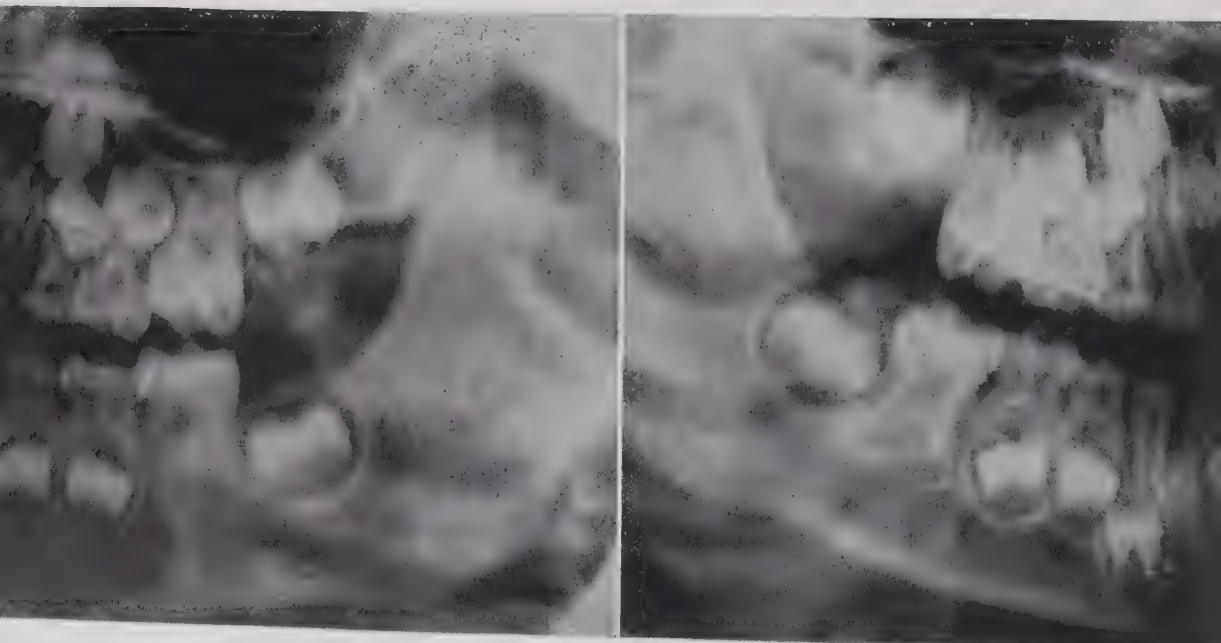
BETTY

FIGURE 628. Dental examination, age 69 months.



BETTY

FIGURE 629. Actual size reproduction of roentgenogram of jaws.  
Chronological age 69 months.



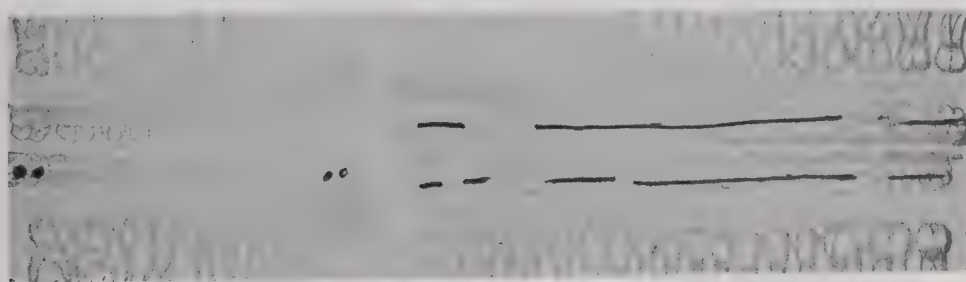
BETTY

FIGURE 630. Actual size reproduction of roentgenogram of jaws.  
Chronological age 75 months.



BETTY

FIGURE 631. Roentgenograms of teeth, age 75 months.



BETTY

FIGURE 632. Dental examination, age 75 months.





BETTY

FIGURE 633. Actual size reproduction of roentgenogram of left hand.  
Chronological age 73 months.





BETTY

FIGURE 634. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 73 months.



BETTY

FIGURE 635. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 73 months.



## BETTY

FIGURE 636. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 73 months.



BETTY

FIGURE 637. Actual size reproduction of roentgenogram of left hip.  
Chronological age 73 months.



BETTY

FIGURE 638. Actual size reproduction of roentgenogram of left knee.  
Chronological age 73 months.





BETTY

FIGURE 639. Actual size reproduction of roentgenogram of left knee.  
Chronological age 73 months.



BETTY

FIGURE 640. Actual size reproduction of roentgenogram of left foot.  
Chronological age 73 months.



BETTY

FIGURE 641. Actual size reproduction of roentgenogram of left foot.  
Chronological age 73 months.



BETTY

FIGURE 642. Actual size reproduction of roentgenogram of left hand.  
Chronological age 75 months.



BETTY

FIGURE 643. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 75 months.





BETTY

FIGURE 644. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 75 months.



BETTY

FIGURE 645. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 75 months.



BETTY

FIGURE 646. Actual size reproduction of roentgenogram of left hip.  
Chronological age 75 months.



BETTY

FIGURE 647. Actual size reproduction of roentgenogram of left knee.  
Chronological age 75 months.



## BETTY

FIGURE 648. Actual size reproduction of roentgenogram of left knee.  
Chronological age 75 months.





BETTY

FIGURE 649. Actual size reproduction of roentgenogram of left foot.  
Chronological age 75 months.



BETTY

FIGURE 650. Actual size reproduction of roentgenogram of left foot.  
Chronological age 75 months.

## ROENTGENOGRAMS OF PROGRESS OF BA

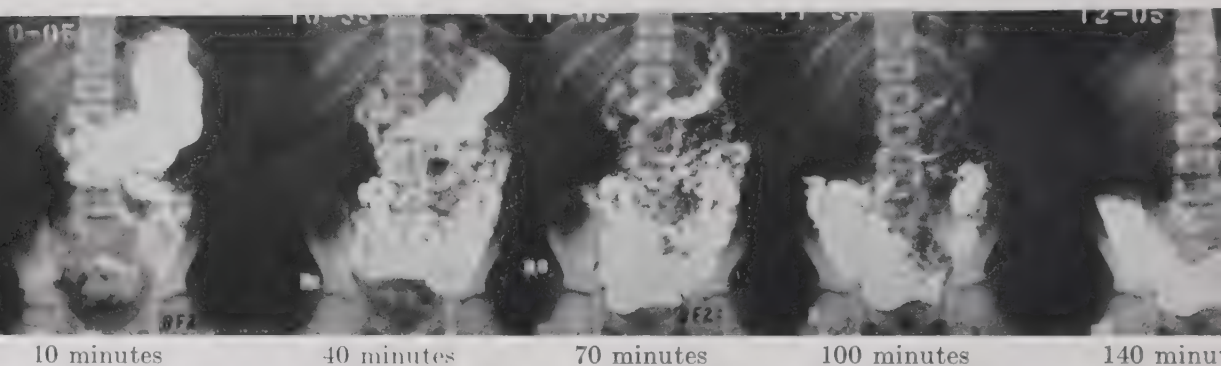


FIGURE 651. Progress of meal consisting of 2 ounces of barium sulfate and 4 ounces of water. The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

BETTY  
Age, 83 months

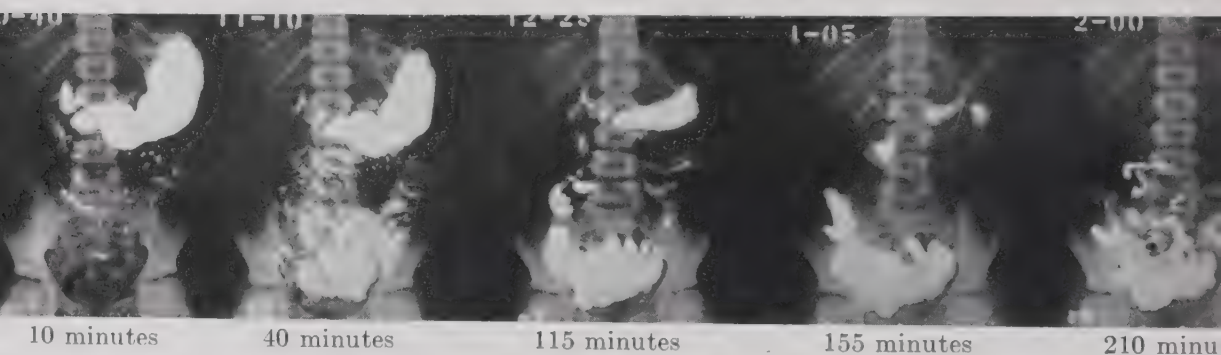


FIGURE 652. Progress of meal consisting of 2 ounces of barium sulfate and 4 ounces of standard pasteurized milk (3.5 per cent fat). The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

BETTY  
Age, 83 months

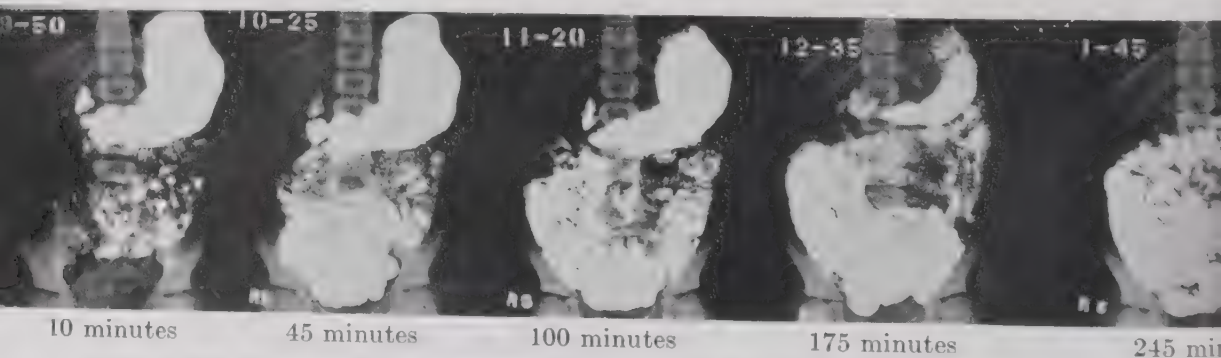
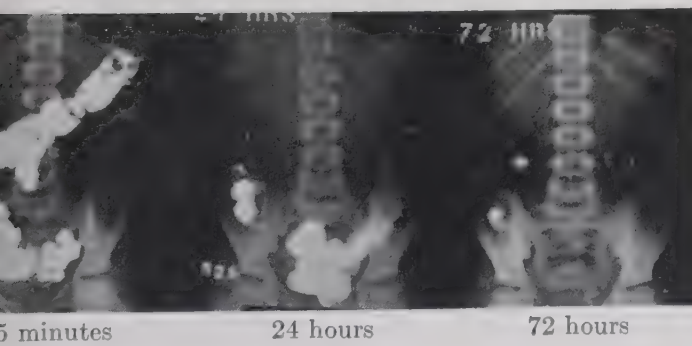
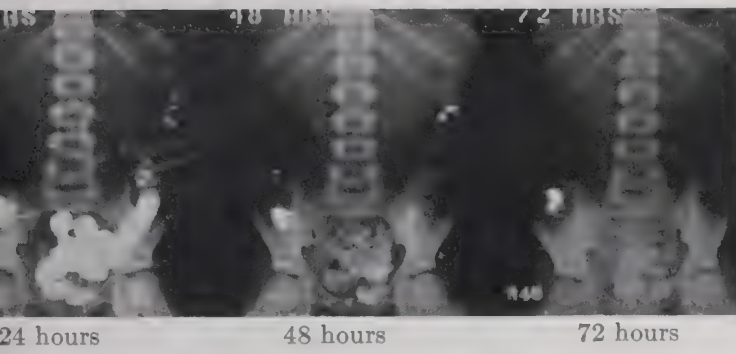
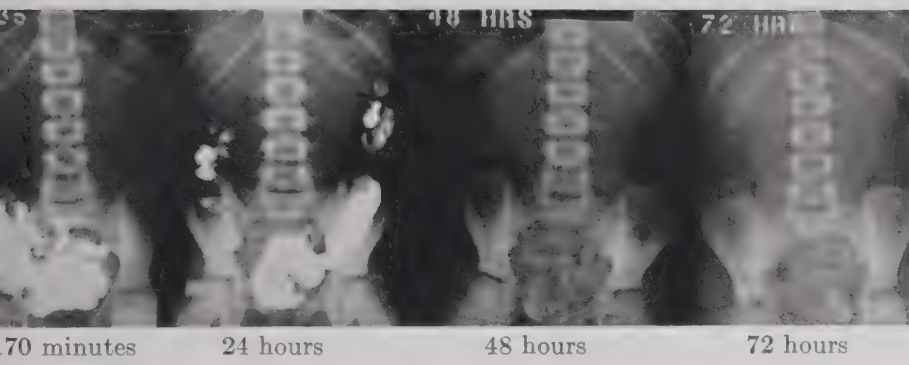


FIGURE 653. Progress of meal consisting of 2 ounces of barium sulfate, 3 ounces of water and 1 ounce of corn syrup (approximately 30 per cent glucose, 61 per cent carbohydrate). The meal was at body temperature when ingested and the first film was exposed about ten minutes later.

BETTY  
Age, 83 months

ALS THROUGH GASTROINTESTINAL TRACT







BETTY

FIGURE 654. Actual size reproduction of roentgenogram of left hand.  
Chronological age 89 months.





BETTY

FIGURE 655. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 89 months.



BETTY

FIGURE 656. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 89 months.



BETTY

FIGURE 657. Actual size reproduction of roentgenogram of left knee.  
Chronological age 89 months.



BETTY

FIGURE 658. Actual size reproduction of roentgenogram of left knee.  
Chronological age 89 months.



BETTY

FIGURE 659. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 89 months.





BETTY

FIGURE 660. Actual size reproduction of roentgenogram of left hip.  
Chronological age 89 months.



BETTY

FIGURE 661. Actual size reproduction of roentgenogram of left foot.  
Chronological age 89 months.



BETTY

FIGURE 662. Actual size reproduction of roentgenogram of left foot.  
Chronological age 89 months.

## JEAN

### Medical History

Jean, the youngest of five children, was 72 months old when she participated in the second study of nutrition and chemical growth in childhood. She had been a full-term infant and was breast-fed for nine months. At the age of four years she had had a tonsilectomy following bronchitis and, in the same year, had a unilateral mastoidectomy. Otherwise, the medical history was essentially negative prior to the study.

Jean's health was good throughout the study but on January 15, while sledding, she collided with a tree. After resting for an hour she vomited and later was unable to retain her lunch. After recovery from the shock of the accident she felt fine. By midafternoon she was hungry and received a special lunch. She ate again at suppertime but was not on the regular study diet until after the following day.

### Psychological

When 74 months old, Jean was examined by the psychologist. On the Stanford-Binet test her M.A. was 84 months, I.Q. 114; on the Arthur Point Scale, M.A. 71 months, I.Q. 96; and on the Goodenough test, M.A. 66 months, I.Q. 89. The examiner commented:

Jean was very anxious to come to the examination room and very anxious to remain there with the examiner. She talked freely. She enjoyed the test problems as games. She was aggressive in gaining attention and approval. She was rarely sure of herself, so she often asked for help but would go ahead by herself when urged to do so. Jean was very conscious of the examiner's keeping a record of her performance and suggested that the examiner put down the letters "O.K." which Jean could understand better. Jean is suggestible, which shows some limit to her critical ability and her self-confidence.

Jean enjoyed drawing pictures, volunteering to draw many more than the examiner had asked for. She liked to see her name written on the paper and asked the examiner to write it on other papers, having the idea that she would come back to use them the following day. She kept making up many excuses to return. When she finally departed she wanted a goodbye kiss.



Endocrinological

Jean was 79 months old when classified by the endocrinologist:

Gain of 9.0 inches since February 11, 1933, a period of 3 years, 1 month. Normal increment for this time and age is 7.6 inches. Child increased from minimal normal height at 3 years, 6 months to optimal normal at 6 years, 7 months. Two upper central incisors show rather marked spacing. The lower central incisors and left central incisor are present. Marked notching of all of them. Slight dryness of the skin over both the upper and lower extremities. Slight subcutaneous thickening. Skin of the body, too, is quite dry and rough.

*Roentgenographic Study for Osseous Development*

Wrist (Anteroposterior)

Carpal bones are all present for her age. Distal epiphysis of the ulna, which normally appears at six, is making its appearance. All other centers are present and normally developed.

Elbow (Anteroposterior)

Internal condyle of the humerus, which normally appears at six, is normally making its appearance. Proximal epiphysis of the radius, which normally makes its appearance at five, is just visible. It is definitely underdeveloped.

Knee (Lateral)

While the epiphyses of the femur, tibia, and fibula are present, the patella, which normally makes its appearance at five, is small and underdeveloped and somewhat ragged in appearance.

Shoulder (Anteroposterior)

Union of the head and greater tuberosity of the humerus, which normally occurs at six, still shows a good line of separation.

Diagnosis: Delay of one to two years in osseous development.

TABLE 367

Jean

HEIGHT AND WEIGHT RECORD\*

Age	Height	Weight	Age	Height	Weight	Age	Height	Weight
months	inches	pounds	months	inches	pounds	months	inches	pounds
40	37	32 $\frac{1}{2}$	56	40 $\frac{3}{4}$	36 $\frac{1}{4}$	71	44 $\frac{3}{4}$	43 $\frac{3}{4}$
43	37	33 $\frac{1}{2}$	60	41	38 $\frac{1}{2}$	75	45 $\frac{1}{2}$	46 $\frac{1}{2}$
48	39 $\frac{1}{4}$	34 $\frac{1}{2}$	69	43 $\frac{3}{4}$	41 $\frac{1}{2}$	79	50 $\frac{1}{4}$	46 $\frac{1}{2}$
52	40 $\frac{3}{4}$	34 $\frac{1}{2}$	69	—	42 $\frac{1}{2}$			

\* Clinical. See also table of recumbent lengths and weights.



TABLE 368

Jean

## RECUMBENT LENGTH AND WEIGHT

Age	RECUMBENT LENGTH		Weight	Age	RECUMBENT LENGTH		Weight
	Total	Stem			Total	Stem	
mo.-days	cm.	cm.	kg.	mo.-days	cm.	cm.	kg.
69-9	113.0	—	19.05	76-9	117.6	64.8	—
71-13	113.0	—	19.96	76-10	—	—	21.50
72-4	—	—	19.35	76-15	—	—	21.67
72-12	—	—	19.42	76-20	—	—	21.70
72-17	—	—	19.54	76-21	117.5	64.8	—
72-21	—	—	19.54	76-28	—	—	22.00
72-25	—	—	19.57	77-2	—	—	22.07
72-29	115.4	64.1	—	77-6	—	—	22.20
73-0	—	—	19.50	77-11	118.1	65.4	—
73-5	—	—	19.72	77-12	—	—	22.17
73-12	—	—	19.67	77-17	—	—	22.45
73-15	115.9	64.4	—	77-22	—	—	22.25
73-16	—	—	19.68	77-25	118.4	65.5	—
73-20	—	—	19.65	77-27	—	—	22.35
73-28	—	—	19.82	78-0	118.1	65.1	—
73-29	116.2	64.1	—	78-3	—	—	22.65
74-2	—	—	20.10	78-7	117.8	65.1	—
74-5	—	—	20.04	78-8	—	—	22.55
74-12	—	—	20.45	78-11	118.7	65.4	—
74-14	116.2	63.6	—	78-13	—	—	22.55
74-16	—	—	20.40	78-17	118.7	66.0	22.50
74-21	—	—	20.69	78-22	—	—	22.47
74-22	116.2	63.9	—	78-23	119.1	65.7	—
74-25	—	—	20.79	78-29	118.9	65.4	22.20
75-1	—	—	20.82	79-2	—	—	22.30
75-5	—	—	20.95	79-4	119.4	65.6	—
75-6	116.4	64.8	—	79-7	—	—	22.25
75-11	—	—	21.00	79-10	119.1	65.3	—
75-15	—	—	21.00	79-13	—	—	22.45
75-21	—	—	21.30	79-16	120.0	65.9	—
75-26	117.1	64.7	—	80-14	119.6	65.4	23.38
75-29	—	—	21.30	81-16	120.3	65.5	22.45
76-0	—	—	21.37	82-20	120.2	66.0	21.93
76-5	—	—	21.39	83-17	120.5	65.3	22.02

Actual values are averages of independent measurements by two workers. In calculating the smooth values given with the balance data the actual values given above were smoothed by three-point averaging and the resulting figures entered for their respective balance periods. Values for balance periods intervening between measurements were obtained by interpolation.

TABLE 369

Jean

## BLOOD DETERMINATIONS

Age	Date	Red cells	Hemo- globin†	WHITE BLOOD CELLS						
				Total	Poly- morpho- nuclears	Lym- pho- cytes	Mono- cytes	Eosino- philes		
months	mo.-day	millions	gm./100 cc.	per c. mm.	per cent	per cent	per cent	per cent		
69	7-9	4.90	12	7750	49	43	5	3		
71	9-13	4.34	12	8600	56	36	5	3		
77	3-12	5.05	13	9900	41	43	10	6		
79	5-12	4.16	11	7550	42	45	7	6		
*80	5-19	4.81	12	—	—	—	—	—		
80	5-19	Hematocrit		RED BLOOD CELL MEASUREMENTS						
				Volume	Weight	Diameter	Thickness			
		per cent		c.μ	μg.	μ	μ			
		42		86	94	7.3	2.1			
		MINERALS (mg. per 100 ml.)								
		SERUM					ERYTHROCYTES			
		Cal- cium	Phos- phorus	So- dium	Potas- sium	Chlor- ine	So- dium	Potas- sium	Chlor- ine	
		72	9-16	11.1	4.43	—	—	—	—	—
		80	5-19	10.9	5.55	320	16.4	390	40	500
				PLASMA NITROGEN AND LIPID (mg. per 100 ml.)						
80	5-19	Nitrogen	Total lipid	Phos- pholipid	Neutral fat	CHOLESTEROL				
						Total	Free	Esters		
		1072	606	175	159	177	38	235		
		ERYTHROCYTE NITROGEN AND LIPID (mg. per 100 gm.)								
80	5-19	4760	443	239	76	120	109	19		
80	5-19	Red blood cells total solids: 33.3 per cent by weight. Specific gravity: plasma, 1.02; red cells, 1.09.								

\* Venous blood.

† Haden-Hauser hemoglobinometer.

TABLE 370

Jean

## BASAL METABOLISM MEASUREMENTS

Age	Date	Sur- face area*	Respi- ration	Pulse rate	Body temper- ature	Blood pres- sure	Basal metab- olism
months	mo.-day	sq.m.	per min.	per min.	°F	S/D†	Cal/24 hr.
72	10-9	0.781	21	—	—	—	919
73	10-29	0.794	18	60	—	—	902
73	11-14	0.800	16	64	98.6	74/48	895
74	11-28	0.804	14	64	98.6	86/58	864
74	12-13	0.814	18	68	98.4	84/56	871
75	12-21	0.818	15	74	98.9	80/56	890
75	1-4	0.824	15	71	98.6	86/60	876
76	1-24	0.833	16	68	98.6	86/58	890
76	2-6	0.839	15	72	98.7	88/62	895
77	2-18	0.842	18	74	98.6	84/62	862
77	3-9	0.852	16	64	98.2	86/62	977
78	3-23	0.856	14	76	98.2	82/64	890
78	3-28	0.858	16	68	98.6	82/58	955
78	4-4	0.857	17	66	98.3	90/64	902
78	4-8	0.862	16	74	98.4	86/58	883
78	4-14	0.861	17	68	98.4	92/64	943
79	4-20	0.863	17	84	98.3	97/64	1025
79	4-26	0.853	20	81	98.6	90/60	996
79	5-1	0.861	22	92	98.5	96/60	1130
79	5-7	0.861	19	76	98.0	96/60	1030
79	5-13	0.867	18	64	98.4	94/66	864

\* DuBois formula.

† Systolic/Diastolic.

TABLE 371

Jean  
78 months

## TEMPERATURE AND PULSE

Date	Temper- ature	Pulse	Date	Temper- ature	Pulse	Date	Temper- ature	Pulse
4-7	98.3	68	4-19	98.4	76	5-2	98.6	88
4-8	98.4	70	4-20	98.3	84	5-3	98.1	80
4-9	98.2	72	4-21	98.1	85	5-4	98.2	92
4-10	98.4	68	4-22	98.4	81	5-5	98.4	92
4-11	98.6	72	4-23	98.2	90	5-6	98.2	80
4-12	98.3	64	4-24	98.4	88	5-7	98.0	76
			4-25	98.6	80			
4-13	98.2	72	4-26	98.6	80	5-8	98.2	75
4-14	98.4	68	4-27	98.2	76	5-9	98.0	76
4-15	98.2	72	4-28	98.6	88	5-10	98.0	72
4-16	98.1	76	4-29	98.4	80	5-11	98.2	68
4-17	98.6	76	4-30	98.4	89	5-12	98.0	72
4-18	98.6	76	5-1	98.5	92	5-13	98.4	64

TABLE 372

Jean  
72 months

FOOD INTAKE  
*Values in grams per day*

Food	DATE							
	10-5 to 11-4	11-4 to 12-4	12-4 to 1-13	1-13 to 2-7	2-7 to 3-3	3-3 to 3-18	3-18 to 3-23*	3-23 to 5-12†
Apple	100	100	200	200	200	100	100	100
Banana	100	100	—	100	100	100	100	100
Beef, lean	100	100	100	100	100	100	100	100
Bread, white	20	20	70	60	60	70	70	70
Bread, whole wheat	30	30	30	30	30	30	30	30
Butter	20	20	30	30	30	21	24	24
Cabbage	25	25	25	25	25	25	25	25
Carrot	25	25	25	25	25	25	25	25
Cheese, American	15	15	15	15	15	15	15	15
Corn flakes	15	15	15	5	5	15	15	15
Egg, whole	50	50	50	50	50	50	50	50
Graham cracker	18	18	18	18	18	18	18	18
Lettuce	20	20	20	20	20	20	20	20
Milk, fluid	400	400†	400†	400†	400	400†	400†	400†
Orange concentrate	50	50	—	—	—	—	—	—
Orange juice, fresh	—	—	—	—	—	50	50	50
Peanut butter	16	16	16	16	16	16	16	16
Potato	40	40	70	70	70	70	70	70
Salt	2	2	2	2	2	2	2	2
Shredded wheat	15	15	15	5	5	15	15	15
Spinach	—	—	—	—	—	100	—	—
Sugar (average)	5	2	4	6	6	8	10	8
Tomato juice	60	60	60	60	60	60	60	60
Water (average)	366	335	283	299	318	395	264	432

\* Oxalic acid, 0.7 gm., and calcium (as acetate) 0.058 gm., additional.  
† Irradiated.  
‡ Thyroid gland (Parke, Davis & Co.), desiccated, 1.5 grains daily April 7 to 22; 6 grains daily April 22 to 27.

TABLE 373

Jean  
74 months

PEDOMETER MEASUREMENTS

Date	Miles	Date	Miles	Date	Miles	Date	Miles	Date	Miles
11-16	1½	12-21	1½	2-1	1½	3-7	1	4-12	1½
11-17	1⅞	12-22	1½	2-2	2	3-8	⅞	4-18	1½
11-23	⅞	12-28	1⅞	2-8	1⅞	3-14	1½	4-19	1½
11-24	1½	1-4	1	2-9	1½	3-21	1½	4-25	⅞
11-30	⅞	1-11	1½	2-15	1½	3-22	⅞	4-26	1½
12-1	1½	1-12	1½	2-16	1	3-28	1½	5-2	2½
12-7	1⅞	1-18	⅞	2-22	1	3-29	1½	5-3	1
12-8	1½	1-19	¾	2-23	1½	4-4	¾	5-9	1½
12-14	1	1-25	1	2-29	1½	4-5	1	5-10	1½
12-15	1⅞	1-26	1½	3-1	1½	4-11	1		

New Haven pedometers were set at 24 inches and worn hooked to belt during hours awake.

BODY LENGTH AND WEIGHT—INTAKE AND ELIMINATION

Date	Recumbent length*	Weight*	INTAKE			AVERAGE DAILY HEAT OF COMBUSTION			FECES				
			AVERAGE DAILY						AVERAGE DAILY			Laxation rate‡	Elimination time§
			Dry wt.*	Total water†	Fat	In-take	Urine	Feces	Wet wt.	Dry wt.*	Fat		
mo.-day	cm.	kg.	gm.	gm.	gm.	Cal.	Cal.	Cal.	gm.	gm.	gm.		hours
10-5	115	19.37	312	1251	57.5	1612	51	47	115.0	12.0	1.2	1.6	32
10-10	115	19.44	314	1268	57.5	1618	61	52	92.4	14.0	1.4	2.2	10
10-15	116	19.50	317	1179	57.5	1631	61	81	102.8	16.0	1.5	2.6	29
10-20	116	19.55	314	1088	57.5	1620	64	75	99.8	17.0	1.7	2.0	26
10-25	116	19.54	314	1144	57.5	1617	63	61	74.4	13.0	1.4	2.0	28
10-30	116	19.60	314	1147	57.5	1618	63	58	72.6	13.0	1.7	1.2	49
11-4	116	19.63	310	1131	59.7	1618	63	78	111.2	15.0	1.7	1.8	11
11-9	116	19.69	307	1135	59.7	1605	62	49	85.2	12.0	1.1	1.8	26
11-14	116	19.67	309	1137	59.7	1613	54	46	71.0	9.0	1.0	1.2	29
11-19	116	19.72	308	1155	59.7	1609	60	56	75.6	11.0	1.0	1.2	25
11-24	116	19.86	310	1188	59.7	1617	62	63	88.8	15.0	1.6	1.6	25
11-29	116	19.99	307	1170	59.7	1604	63	43	66.0	9.0	1.1	1.0	50
12-4	116	20.20	321	1104	74.0	1734	66	52	72.6	12.0	1.5	1.2	25
12-9	116	20.30	322	1105	74.0	1736	66	62	81.4	12.0	1.6	1.0	30
12-14	116	20.51	323	1070	74.0	1741	65	59	72.4	10.0	1.4	1.2	30
12-19	116	20.63	322	1131	74.0	1737	63	44	69.4	10.0	1.2	1.0	25
12-24	116	20.77	333	1112	74.0	1780	62	62	81.2	11.0	1.3	1.0	34
12-29	116	20.85	329	1132	74.0	1763	68	61	102.4	14.0	1.7	1.0	49
1-3	117	20.92	322	1121	74.0	1737	56	71	81.8	14.0	1.9	1.0	35
1-8	117	20.98	327	1222	74.0	1756	65	66	63.4	18.0	2.4	1.0	30
###													
1-18	117	21.20	336	1181	73.5	1768	66	57	73.8	16.0	1.8	1.2	35
1-23	117	21.32	332	1318	73.5	1748	65	65	75.6	11.0	1.4	1.0	35
1-28	117	21.35	333	1123	73.5	1755	65	76	72.2	18.0	2.4	1.4	11
2-2	117	21.42	338	1189	73.5	1776	67	56	83.2	11.0	1.4	1.0	35
2-7	118	21.52	334	1224	73.5	1760	64	73	92.8	18.0	2.2	1.8	11
2-12	118	21.62	339	1198	73.5	1782	—	72	87.0	14.0	1.8	1.0	30
2-17	118	21.79	332	1176	73.5	1753	65	56	64.8	11.0	1.7	1.0	30
2-22	118	21.92	334	1249	73.5	1761	60	56	59.8	13.0	1.9	0.8	30
2-27	118	22.09	333	1270	73.5	1758	64	68	86.6	16.0	2.2	1.0	30
3-3	118	22.15	354	1325	68.0	1752	68	73	76.8	20.0	2.2	1.0	6
3-8	118	22.27	360	1395	68.0	1778	66	94	75.8	24.0	2.7	1.2	8
3-13	118	22.29	358	1331	68.0	1768	73	65	88.8	14.0	1.8	1.2	11
3-18	118	22.35	344	1136	68.5	1773	67	47	71.4	15.0	2.0	0.6	30
3-23	118	22.42	337	1172	68.5	1779	65	92	101.8	19.0	2.4	1.4	32
3-28	118	22.52	335	1216	68.5	1771	70	73	77.2	17.0	2.3	1.0	6
4-2	118	22.58	335	1044	68.5	1771	69	61	79.6	12.7	1.5	1.0	34
4-7	118	22.53	332	1224	68.5	1757	68	60	83.2	11.0	1.3	0.8	10
4-12	118	22.51	334	1220	68.5	1767	66	72	85.8	16.0	1.9	1.4	7
4-17	119	22.39	332	1306	68.5	1756	75	93	104.8	20.0	2.6	1.2	26
4-22	119	22.32	332	1281	68.5	1758	74	97	76.0	21.0	3.0	1.2	30
4-27	119	22.25	330	1441	68.5	1751	74	86	110.2	19.0	2.6	1.8	8
5-2	119	22.33	336	1411	68.5	1772	71	70	82.2	18.0	2.7	1.0	49
5-7	120	22.38	334	1816	68.5	1768	54	78	77.0	16.0	2.0	1.2	30

The age given is the initial age at start of study. Dates given are first days of five-day balance periods. Italic figures were omitted from calculations of the averages given in Volume I.  
\* See Table 368 for actual values and method of smoothing.  
+ Based on alcohol-dried food and oven-dried feces.  
† Drinking water plus water in foods.  
‡ Average number of defecations per day.  
§ Elapsed time between ingestion and defecation of marker used to separate feces of five-day periods.  
# See case history, page 1177, for explanation for missing periods.



TABLE 375

Jean  
72 months

## NITROGEN AND NEGATIVE MINERALS IN INTAKE, URINE, FECES

*Values are averages per day*

Date	NITROGEN			PHOSPHORUS			CHLORINE			SULFUR		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
10-5	9.45	8.14	1.09	996	682	306	3031	2572	32	612	530	59
10-10	9.45	7.94	1.00	996	607	323	3031	2605	37	612	524	60
10-15	9.45	7.99	1.00	996	572	400	3031	2664	37	612	560	84
10-20	9.45	8.54	1.00	996	741	382	3031	2890	28	612	570	75
10-25	9.45	8.44	0.88	996	701	332	3031	2922	16	612	587	60
10-30	9.45	8.41	0.84	996	653	339	3031	2760	34	612	616	60
11-4	9.45	8.38	1.53	996	600	405	3031	2982	87	612	568	81
11-9	9.45	8.58	0.68	996	621	252	3031	2816	43	612	568	49
11-14	9.45	8.61	0.84	996	638	257	3031	2782	64	612	570	45
11-19	9.45	8.41	0.91	996	618	282	3031	2696	48	612	645	53
11-24	9.45	8.44	0.92	996	554	308	3031	2806	41	612	545	59
11-29	9.45	8.49	0.77	996	599	263	3031	2722	35	612	542	49
12-4	10.28	8.81	0.89	1059	616	262	3300	3432	28	686	571	53
12-9	10.28	9.16	0.98	1059	631	300	3300	3110	40	686	584	54
12-14	10.28	8.56	0.94	1059	594	286	3300	2820	55	686	574	59
12-19	10.28	8.56	0.92	1059	588	223	3300	2826	40	686	558	46
12-24	10.28	8.70	1.02	1059	629	319	3300	3000	53	686	581	61
12-29	10.28	9.01	1.00	1059	617	308	3300	3120	55	686	602	63
1-3	10.28	8.96	1.04	1059	598	316	3300	3060	68	686	601	70
1-8	10.28	8.82	0.90	1059	605	349	3300	3240	45	686	586	61
***												
1-18	10.02	8.57	0.85	1032	574	276	3305	2829	69	663	564	56
1-23	10.02	8.21	1.07	1032	539	288	3305	2955	71	663	530	64
1-28	10.02	8.48	0.82	1032	609	353	3305	3123	65	663	573	72
2-2	10.02	8.67	0.95	1032	712	247	3305	3138	52	663	566	51
2-7	10.02	8.48	1.06	1032	610	297	3305	2898	64	663	570	71
2-12	10.02	8.43	1.05	1032	602	289	3305	2898	72	663	557	71
2-17	10.02	8.12	0.92	1032	553	262	3305	3064	30	663	554	52
2-22	10.02	8.39	0.80	1032	652	262	3305	2789	30	663	560	54
2-27	10.02	8.56	1.05	1032	639	291	3305	2922	44	663	568	67
3-3	10.68	8.86	0.95	1175	678	325	3955	3910	44	726	608	72
3-8	10.68	8.94	1.11	1175	710	410	3955	3768	77	726	614	99
3-13	10.68	9.02	1.09	1175	702	279	3955	3739	70	726	604	65
3-18	10.39	8.68	0.90	1088	738	293	3418	3336	73	698	597	56
3-23	10.39	8.58	1.13	1088	684	368	3418	3276	74	698	577	86
3-28	10.39	8.46	0.96	1088	623	354	3418	3401	27	698	601	62
4-2	10.39	8.61	0.92	1088	664	275	3418	3540	24	698	570	56
4-7	10.39	8.82	0.95	1088	686	285	3418	3282	38	698	578	52
4-12	10.39	9.38	1.03	1088	752	307	3418	3444	54	698	610	66
4-17	10.39	9.65	1.10	1088	771	365	3418	3214	59	698	615	91
4-22	10.39	9.64	1.05	1088	749	418	3418	3473	48	698	611	93
4-27	10.39	9.82	1.29	1088	636	336	3418	3338	83	698	604	84
5-2	10.39	9.01	0.97	1088	562	360	3418	3070	104	698	581	62
5-7	10.39	7.06	1.04	1088	563	368	3418	2976	124	698	474	77

\* See footnotes to Table 374.

TABLE 376

Jean  
72 months

## POSITIVE MINERALS IN INTAKE, URINE, FECES

*Values are averages per day*

Date	CALCIUM			MAGNESIUM			SODIUM			POTASSIUM		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
10-5	722	116	581	248	94	138	1876	1590	84	2252	1912	314
10-10	722	112	580	248	84	135	1876	1579	53	2252	1750	307
10-15	722	109	551	248	93	136	1876	1721	70	2252	1910	330
10-20	722	105	555	248	92	137	1876	1852	51	2252	1882	311
10-25	722	107	560	248	99	135	1876	1993	23	2252	1901	279
10-30	722	127	528	248	88	122	1876	1650	18	2252	1922	302
11-4	722	106	855	248	93	214	1876	1898	111	2252	1905	519
11-9	722	119	380	248	98	97	1876	1703	38	2252	1901	182
11-14	722	132	530	248	101	128	1876	1668	33	2252	1886	236
11-19	722	115	554	248	100	127	1876	1629	53	2252	1852	276
11-24	722	113	554	248	100	128	1876	1653	46	2252	1917	301
11-29	722	97	568	248	109	118	1876	1700	20	2252	1555	275
12-4	763	118	528	237	115	103	2173	2242	22	2146	1724	303
12-9	763	103	601	237	109	121	2173	2007	23	2146	1730	323
12-14	763	94	556	237	93	115	2173	1960	29	2146	1620	261
12-19	763	87	536	237	114	110	2173	1872	19	2146	1662	278
12-24	763	106	564	237	144	116	2173	2071	40	2146	1801	306
12-29	763	105	558	237	138	106	2173	2142	70	2146	1840	317
1-3	763	103	585	237	125	115	2173	2034	19	2146	1841	323
1-8	763	90	534	237	106	100	2173	2085	12	2146	1578	270
***												
1-18	753	81	525	260	110	118	2059	1879	38	2469	2071	292
1-23	753	78	572	260	120	120	2059	1891	23	2469	2571	329
1-28	753	92	519	260	109	106	2059	1992	30	2469	2028	291
2-2	753	82	502	260	108	105	2059	1974	44	2469	1980	284
2-7	753	83	523	260	110	119	2059	1852	52	2469	2024	343
2-12	753	80	529	260	87	111	2059	1900	64	2469	1874	345
2-17	753	81	547	260	80	130	2059	1910	10	2469	2042	300
2-22	753	71	471	260	111	109	2059	1874	14	2469	1964	260
2-27	753	70	577	260	111	123	2059	1918	28	2469	1863	323
3-3	825	78	549	336	116	152	2545	2586	40	2785	2108	299
3-8	825	81	602	336	122	172	2545	2420	63	2785	2239	320
3-13	825	78	597	336	131	177	2545	2354	52	2785	2257	327
3-18	832	66	582	282	120	122	2169	2417	23	2676	2156	324
3-23	775	80	554	282	114	137	2169	2029	53	2676	2070	340
3-28	775	60	518	282	110	131	2169	2079	37	2676	1993	299
4-2	775	70	490	282	116	118	2169	2189	47	2676	2149	268
4-7	775	80	537	282	116	132	2169	2024	43	2676	2055	280
4-12	775	82	531	282	131	115	2169	2086	59	2676	2183	276
4-17	775	84	581	282	128	118	2169	1986	64	2676	2131	364
4-22	775	92	576	282	126	113	2169	2085	32	2676	2229	288
4-27	775	103	674	282	129	130	2169	2051	64	2676	2105	373
5-2	775	89	599	282	106	118	2169	1894	36	2676	2040	267
5-7	775	58	609	282	112	129	2169	1798	29	2676	1857	282

\* See footnotes to Table 374.

TABLE 377

Jean  
72 months

## COMPLEX CARBOHYDRATES IN INTAKE AND FECES

*Values in grams per day*

Date	LIGNIN		CELLULOSE		HEMICELLULOSE		
	Intake	Feces	Intake	Feces	INTAKE		Feces
					Total	Stable	
10-5	1.28	0.92	2.08	0.58	2.17	1.72	0.66
10-10	1.28	1.13	2.08	0.66	2.17	1.72	0.75
10-15	1.28	1.24	2.08	0.90	2.17	1.72	0.84
10-20	1.28	1.43	2.08	0.87	2.17	1.72	1.05
10-25	1.28	1.25	2.08	0.68	2.17	1.72	0.78
10-30	1.28	1.21	2.08	0.54	2.17	1.72	0.69
11-4	1.28	1.45	2.08	0.68	2.17	1.72	0.80
11-9	1.28	1.37	2.08	0.57	2.17	1.72	0.73
11-14	1.28	0.74	2.08	0.45	2.17	1.72	0.40
11-19	1.24	1.60	2.03	0.52	1.99	1.52	0.53
11-24	1.31	1.43	2.14	0.76	2.35	1.93	0.97
11-29	1.24	0.96	2.03	0.45	1.99	1.52	0.59
12-4	1.07	1.02	2.55	0.48	2.51	1.93	0.70
12-9	1.07	0.96	2.55	0.53	2.51	1.93	0.74
12-14	1.07	0.75	2.55	0.45	2.51	1.93	0.64
12-19	1.07	0.87	2.55	0.52	2.51	1.93	0.54
12-24	1.07	1.02	2.55	0.48	2.51	1.93	0.62
12-29	1.07	0.96	2.55	0.73	2.51	1.93	0.83
1-3	1.07	1.08	2.55	0.57	2.51	1.93	0.89
1-8	1.07	1.32	2.55	0.74	2.51	1.93	1.09
***							
1-18	1.40	1.74	2.48	0.60	2.10	1.56	0.93
1-23	1.41	1.16	2.50	0.44	2.16	1.63	0.52
1-28	1.41	1.89	2.50	0.55	2.16	1.63	0.98
2-2	1.41	1.06	2.50	0.28	2.16	1.63	0.62
2-7	1.41	1.82	2.50	0.71	2.16	1.63	0.99
2-12	1.41	1.52	2.50	0.58	2.16	1.63	0.73
2-17	1.41	1.30	2.50	0.52	2.16	1.63	0.54
2-22	1.41	1.38	2.50	0.43	2.16	1.63	0.67
2-27	1.41	1.91	2.50	0.58	2.16	1.63	0.72
3-3	1.46	1.92	2.61	0.92	2.61	1.98	1.26
3-8	1.46	2.33	2.61	0.92	2.61	1.98	1.42
3-13	1.46	1.29	2.61	0.64	2.61	1.98	0.79
3-18	1.33	1.37	2.32	0.76	2.47	1.89	0.85
3-23	1.33	1.55	2.32	0.81	2.47	1.89	1.10
3-28	1.36	1.43	2.37	0.73	2.65	2.09	0.99
4-2	1.33	1.17	2.32	0.51	2.47	1.89	0.72
4-7	1.33	1.12	2.32	0.53	2.47	1.89	0.72
4-12	1.33	1.42	2.32	0.86	2.47	1.89	0.97
4-17	1.33	1.76	2.32	0.96	2.47	1.89	1.20
4-22	1.33	1.56	2.32	1.10	2.47	1.89	1.07
4-27	1.33	1.50	2.32	0.81	2.47	1.89	1.03
5-2	1.33	1.55	2.32	0.70	2.47	1.89	1.04
5-7	1.33	1.54	2.32	0.76	2.47	1.89	0.96

TABLE 378

Jean  
78 months

## NITROGEN PARTITION OF URINE

*Values in grams of nitrogen per day*

Date	Total nitrogen	Urea	Ammonia	Creatinine + Creatine	Creatinine	Uric acid
3-28	6.87	6.075	0.285	0.246	0.179	0.115
3-29	10.10	9.072	0.360	0.364	0.254	0.164
3-30	8.87	7.624	0.336	0.323	0.186	0.119
3-31	8.24	7.212	0.288	0.313	0.163	0.122
4-1	8.22	7.458	0.282	0.315	0.154	0.107
4-2	8.33	7.017	0.243	0.309	0.164	0.134
4-3	8.52	7.371	0.249	0.318	0.160	0.120
4-4	8.84	7.502	0.278	0.337	0.177	0.129
4-5	8.84	7.905	0.255	0.346	0.189	0.145
4-6	8.52	7.667	0.213	0.333	0.181	0.139
4-7	8.68	7.899	0.301	0.285	0.160	0.125
4-8	8.63	7.673	0.267	0.320	0.167	0.135
4-9	8.66	7.253	0.247	0.346	0.156	0.121
4-10	9.36	8.237	0.273	0.370	0.184	0.130
4-11	8.76	7.737	0.263	0.336	0.164	0.118
4-12	9.59	8.238	0.282	0.398	0.208	0.146
4-13	8.84	7.766	0.274	0.345	0.173	0.127
4-14	9.40	8.204	0.256	0.386	0.205	0.124
4-15	9.33	8.180	0.260	0.389	0.171	0.116
4-16	9.76	8.772	0.264	0.385	0.190	0.123
4-17	9.98	9.000	0.282	0.455	0.195	0.142
4-18	9.68	8.578	0.276	0.335	0.205	0.139
4-19	9.71	8.588	0.272	0.355	0.192	0.129
4-20	9.51	8.443	0.353	0.289	0.183	0.131
4-21	9.36	8.474	0.264	0.324	0.171	0.137
4-22	9.74	8.721	0.320	0.313	0.171	0.136
4-23	9.74	8.676	0.250	0.329	0.204	0.130
4-24	9.77	8.484	0.274	0.353	0.214	0.131
4-25	8.55	8.615	0.301	0.335	0.170	0.134
4-26	9.42	8.470	0.266	0.298	0.177	0.133
4-27	9.78	8.767	0.283	0.377	0.177	0.132
4-28	9.91	8.551	0.288	0.358	0.196	0.142
4-29	9.25	8.195	0.265	0.329	0.162	0.135
4-30	10.10	9.037	0.297	0.325	0.186	0.134
5-1	10.07	9.006	0.274	0.341	0.190	0.134
5-2	8.63	7.643	0.243	0.299	0.177	0.114
5-3	9.57	8.495	0.287	0.302	0.171	0.131
5-4	9.38	8.356	0.246	0.269	0.167	0.129
5-5	8.82	7.742	0.254	0.247	0.173	0.128
5-6	8.63	8.018	0.250	0.256	0.170	0.128
5-7	7.32	6.636	0.298	0.212	0.152	0.119
5-8	8.21	7.476	0.281	0.284	0.217	0.138
5-9	6.61	6.109	0.219	0.171	0.143	0.104
5-10	7.70	6.872	0.270	0.271	0.206	0.127
5-11	5.46	5.271	0.175	0.169	0.143	0.104

The age given is the initial age at start of study.



ANTHROPOMETRIC MEASUREMENTS  
*Values in centimeters*

Age*	BREADTH			LENGTH		WIDTH	
	Biacro-mial	Intertro-chanteric	Inter-crystal	Tibia	Head	Chest	Head
73	21.0	20.3	18.2	24.7	17.9	17.8	13.2
74	21.2	20.7	18.6	25.0	18.0	17.5	14.0
75	21.2	20.4	18.8	25.0	17.9	18.7	14.0
77	21.4	21.3	19.2	24.6	18.0	18.0	14.0
77	21.7	21.6	19.5	24.7	18.0	17.5	13.9
78	21.6	21.7	19.8	25.0	18.0	18.3	13.8
79	21.4	21.7	19.4	25.0	18.0	17.6	13.8
80	22.3	21.8	19.6	25.6	17.9	18.3	14.0
81	22.2	21.5	19.3	25.8	17.9	17.6	14.1
83	23.0	21.3	19.2	26.0	18.0	17.1	13.8
84	22.9	21.1	19.3	26.3	18.0	17.3	13.9

Age*	DEPTH	CIRCUMFERENCES				
	Chest	Head	Chest	Thigh	Abdomen	Upper arm
73	14.5	49.5	55	30	52	14.6
74	14.3	51.0	54	31	52	14.7
75	15.0	49.5	57	32	55	15.3
77	14.5	50.2	56	33	55	15.5
77	14.2	49.5	57	34	53	16.0
78	15.0	50.2	56	33	54	16.4
79	14.5	50.8	56	34	52	16.0
80	15.3	50.6	56	34	54	16.4
81	14.6	50.0	56	33	53	16.0
83	14.0	50.0	55	32	51	15.6
84	14.5	50.0	55	32	52	15.5

\* Months.

TABLE 380

Jean  
72 months

IRON IN INTAKE, URINE AND FECES  
*Values are averages per day*

Date	Intake	Urine	Feces	Date	Intake	Urine	Feces	Date	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mo.-day	mg.	mg.	mg.	mo.-day	mg.	mg.	mg.
10-5	7.39	0.00	5.25	12-19	7.96	0.06	5.12	3-3	9.18	0.04	9.25
10-10	7.39	0.12	6.74	12-24	7.96	0.07	4.84	3-8	9.18	0.42	9.96
10-15	7.39	0.21	6.04	12-29	7.96	0.05	5.65	3-13	9.18	0.39	6.53
10-20	7.39	0.04	7.97	1-3	7.96	0.00	6.20	3-18	8.20	0.11	6.64
10-25	7.39	0.00	6.63	1-8	7.96	0.12	8.50	3-23	8.20	0.06	7.03
10-30	7.39	0.00	6.37	§§§				3-28	8.20	0.14	39.85
11-4	7.40	0.00	6.94	1-18	7.80	0.10	6.36	4-2	8.20	0.09	4.44
11-9	7.40	0.01	5.28	1-23	7.80	0.00	4.56				
11-14	7.40	0.09	4.00	1-28	7.80	0.09	7.47	4-7	8.20	0.09	4.61
11-19	7.40	0.11	4.92	2-2	7.80	0.12	4.11	4-12	8.20	0.02	6.64
11-24	7.40	0.00	5.92	2-7	7.79	0.10	6.88	4-17	8.20	0.10	8.30
11-29	7.40	0.09	4.96	2-12	7.79	—	4.86	4-22	8.20	0.23	8.79
12-4	7.96	0.16	5.02	2-17	7.79	0.37	4.34	4-27	8.20	0.21	7.36
12-9	7.96	0.00	6.15	2-22	7.79	0.03	5.43	5-2	8.20	0.28	8.10
12-14	7.96	0.14	4.62	2-27	7.79	0.02	6.32	5-7	8.20	0.20	7.52

The age given is the initial age at start of study. Dates given are first days of five-day balance periods.  
Italic figures were omitted from calculations of averages given in Volume I.  
§§§ See case history, page 1177, for explanation for missing periods.



TABLE 381

Jean

## MEASUREMENTS OF THE BONES OF THE WRIST

AGE, months	69	71	77	79
CARPALS				
AREA, sq. mm.				
Hamate	73	74	79	83
Capitate	123	123	130	135
Lesser Multangular	8	10	18	20
Greater Multangular	22	24	28	37
Navicular	14	16	23	27
Lunate	27	29	38	38
Triangular	47	50	55	57
GREATEST DIAMETER, mm.				
Hamate	11	12	12	12
Capitate	16	16	17	17
Lesser Multangular	4	5	6	6
Greater Multangular	6	7	7	8
Navicular	5	5	7	7
Lunate	6	7	8	8
Triangular	9	10	10	10
Epiphyses				
1st Metacarpal	6	7	7	8
2nd Metacarpal	8	9	10	10
3rd Metacarpal	8	9	9	10
4th Metacarpal	6	8	8	8
ULNA				
DIAMETER, mm.				
Distal epiphysis	1	3	7	8
Distal metaphysis	12	12	12	13
RADIUS				
DIAMETER, mm.				
Distal epiphysis	17	17	18	18
WRIST AREA,* sq. mm.	884	952	1022	1024

\* Measured with the planimeter using Flory's landmarks (Monographs of the Society for Research in Child Development, Vol. I, No. 3, 1936).

TABLE 382

Jean

## SKELETAL MATURATION

*Values in months*

Chrono- logical age	HAND			FOOT	ELBOW	KNEE	HIP	SHOULDER	AVERAGE
	B.B.G.*	Flory†	Todd‡	Todd‡	Todd‡	Todd‡	Todd‡	Todd‡	Todd‡
69	67	57	74	67	64	69	74	65	69
71	66	53	78	69	69	71	75	69	72
77	71	57	81	74	72	77	83	74	77
79	74	61	82	77	75	78	86	75	79

\* Baldwin, B. T., Busby, L. M., Garside, H. V. Anatomic growth of children. University of Iowa Studies in Child Welfare, vol. 4, no. 1, 1928.

† Flory, C. D. Osseous development in the hand as an index of skeletal development. Monographs of the Society for Research in Child Development, vol. 1, no. 3, 1936.

‡ Determined by T. Wingate Todd, C. C. Francis, and Idell Pyle, Western Reserve University, Cleveland.



FIGURE 663. JEAN  
Age 75 months





JEAN

FIGURE 664. Actual size reproduction of roentgenogram of left hand.  
Chronological age 69 months.



JEAN

FIGURE 665. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 69 months.



JEAN

FIGURE 666. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 69 months.





JEAN

FIGURE 667. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 69 months.



JEAN

FIGURE 668. Actual size reproduction of roentgenogram of left hip.  
Chronological age 69 months.



JEAN

FIGURE 669. Actual size reproduction of roentgenogram of left knee.  
Chronological age 69 months.



JEAN

FIGURE 670. Actual size reproduction of roentgenogram of left knee.  
Chronological age 69 months.



JEAN

FIGURE 671. Actual size reproduction of roentgenogram of left foot.  
Chronological age 69 months.





JEAN

FIGURE 672. Actual size reproduction of roentgenogram of left foot.  
Chronological age 69 months.



JEAN

FIGURE 673. Actual size reproduction of roentgenogram of left hand.  
Chronological age 71 months.



JEAN

FIGURE 674. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 71 months.



JEAN

FIGURE 675. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 71 months.



JEAN

FIGURE 676. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 71 months.





JEAN

FIGURE 677. Actual size reproduction of roentgenogram of left hip.  
Chronological age 71 months.



JEAN

FIGURE 678. Actual size reproduction of roentgenogram of left knee.  
Chronological age 71 months.



JEAN

FIGURE 679. Actual size reproduction of roentgenogram of left knee.  
Chronological age 71 months.



JEAN

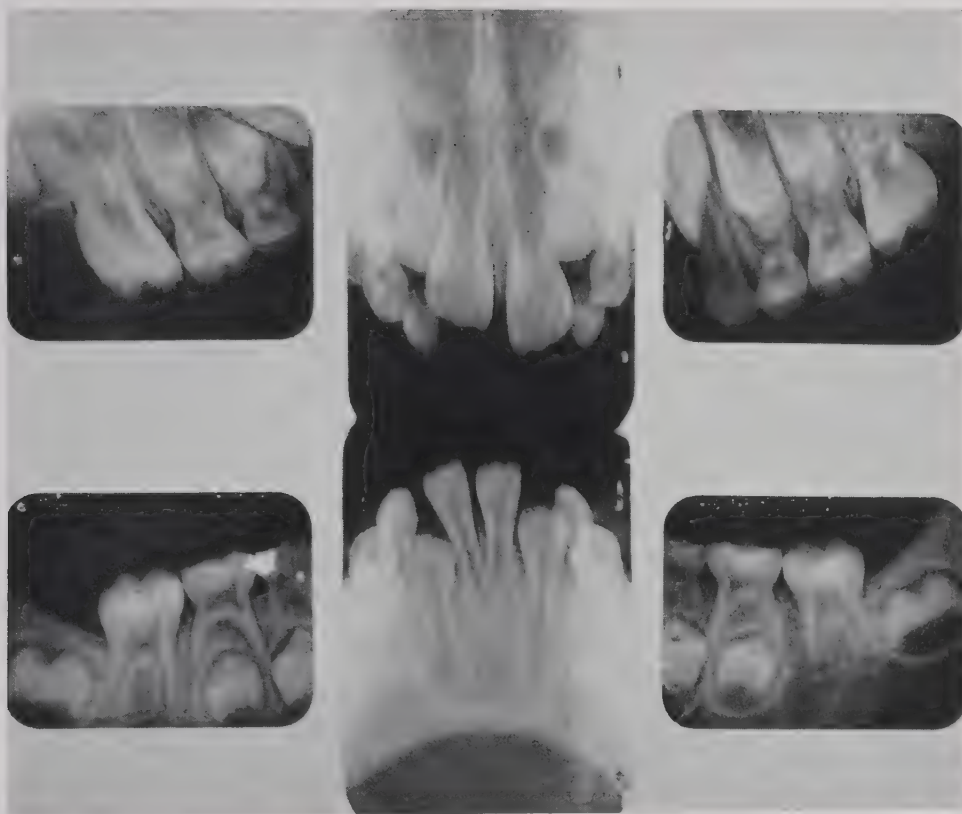
FIGURE 680. Actual size reproduction of roentgenogram of left foot.  
Chronological age 71 months.



JEAN

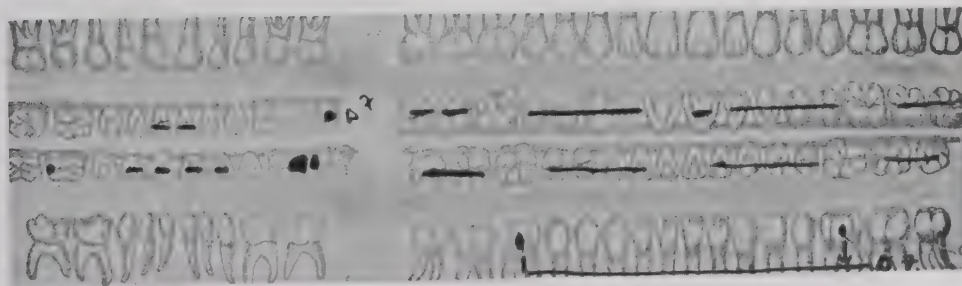
FIGURE 681. Actual size reproduction of roentgenogram of left foot.  
Chronological age 71 months.





JEAN

FIGURE 682. Roentgenograms of teeth, age 74 months.



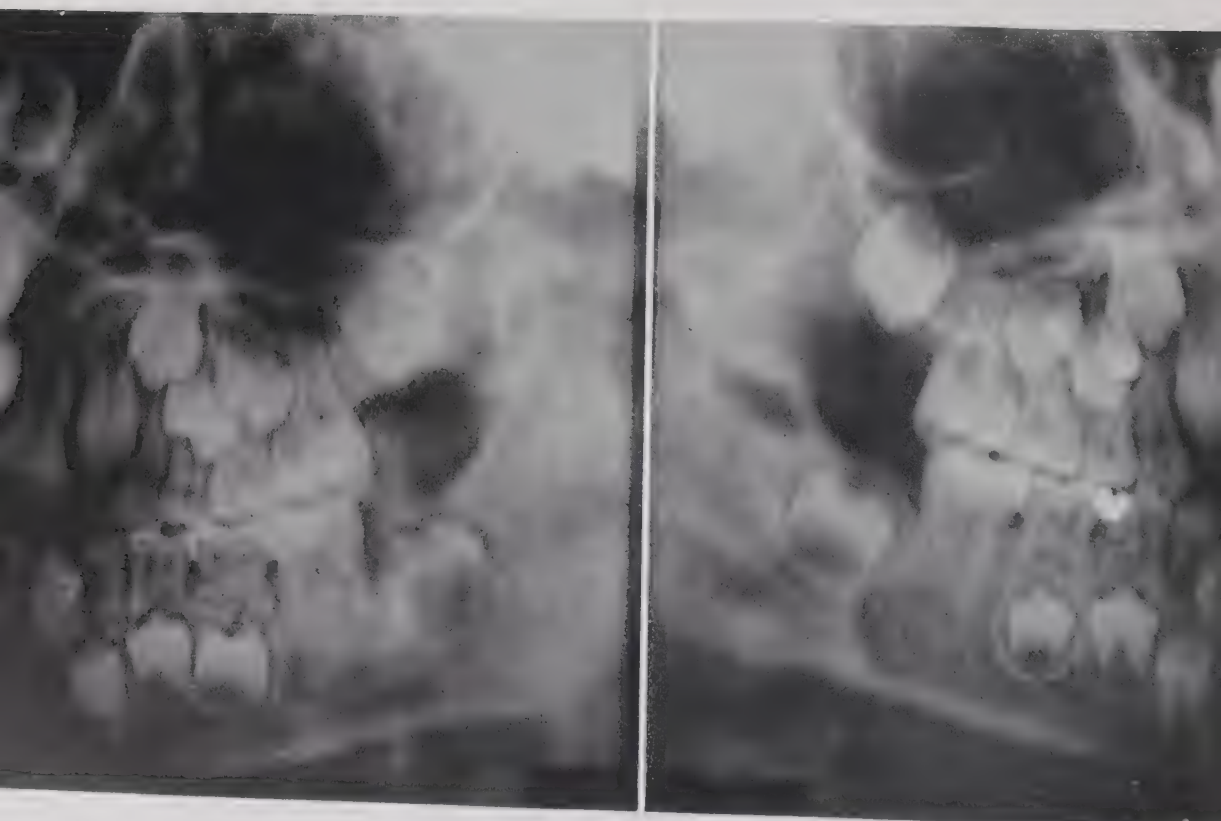
JEAN

FIGURE 683. Dental examination, age 74 months.



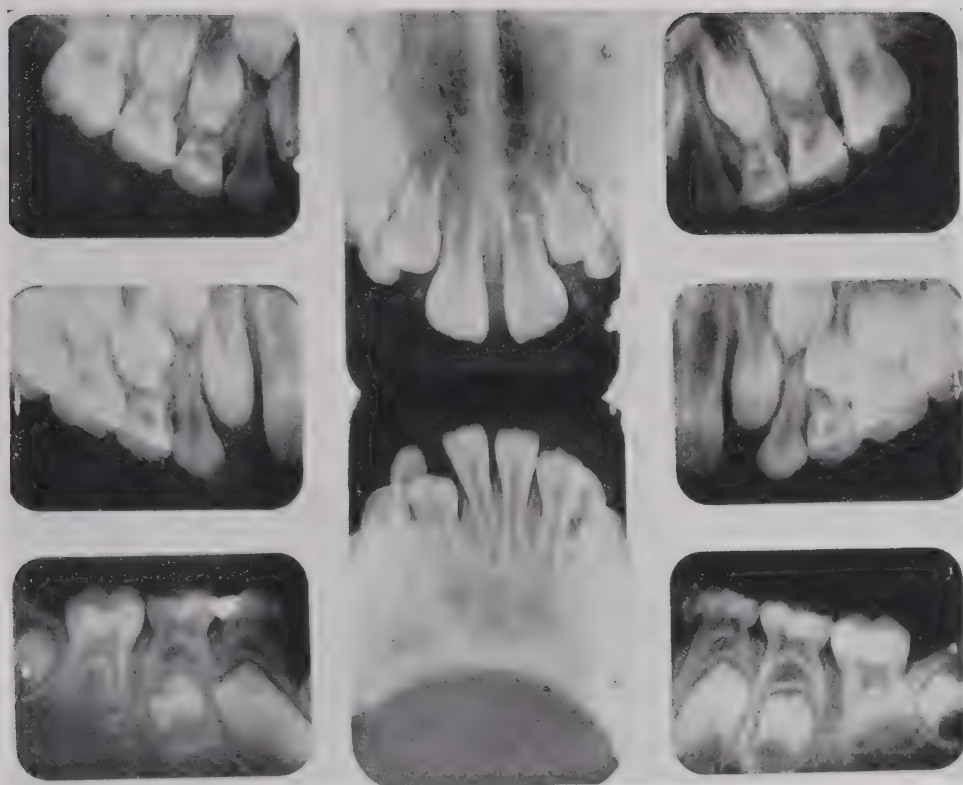
JEAN

FIGURE 684. Actual size reproduction of roentgenogram of jaws.  
Chronological age 74 months.



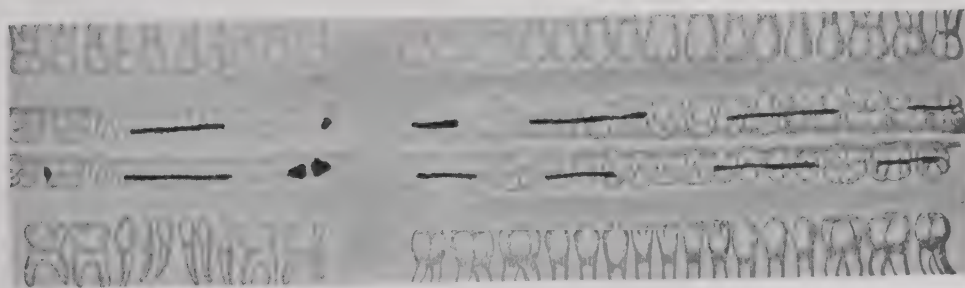
JEAN

FIGURE 685. Actual size reproduction of roentgenogram of jaws.  
Chronological age 79 months.



JEAN

FIGURE 686. Roentgenograms of teeth, age 79 months.



JEAN

FIGURE 687. Dental examination, age 79 months.



JEAN

FIGURE 688. Actual size reproduction of roentgenogram of left hand.  
Chronological age 77 months.





JEAN

FIGURE 689. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 77 months.





JEAN

FIGURE 690. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 77 months.



JEAN

FIGURE 691. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 77 months.



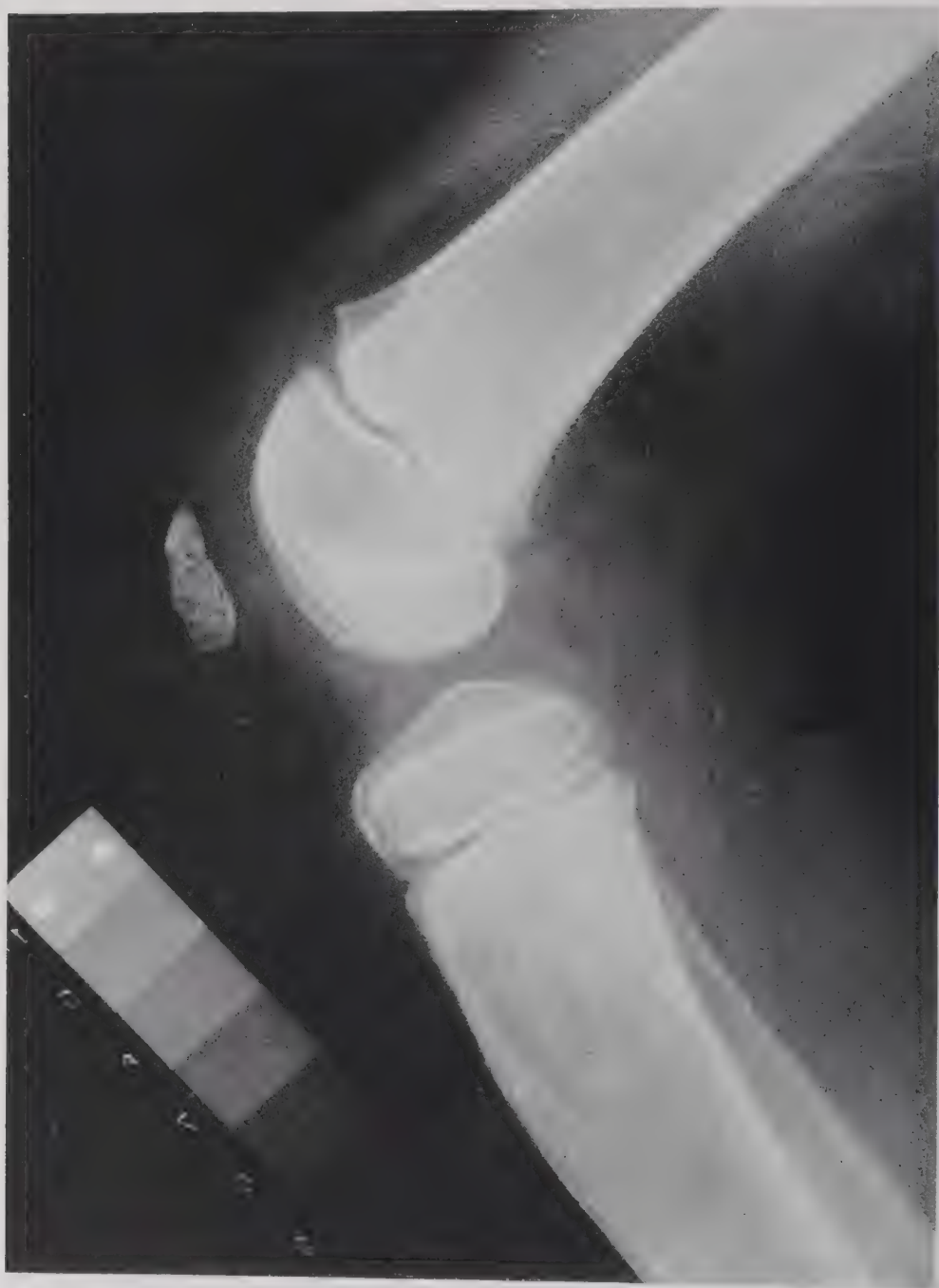
JEAN

FIGURE 692. Actual size reproduction of roentgenogram of left hip.  
Chronological age 77 months.



JEAN

FIGURE 693. Actual size reproduction of roentgenogram of left knee.  
Chronological age 77 months.



JEAN

FIGURE 694. Actual size reproduction of roentgenogram of left knee.  
Chronological age 77 months.





JEAN

FIGURE 695. Actual size reproduction of roentgenogram of left foot.  
Chronological age 77 months.



JEAN

FIGURE 696. Actual size reproduction of roentgenogram of left foot.  
Chronological age 77 months.



JEAN

FIGURE 697. Actual size reproduction of roentgenogram of left hand.  
Chronological age 79 months.



JEAN

FIGURE 698. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 79 months.



JEAN

FIGURE 699. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 79 months.





JEAN

FIGURE 700. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 79 months.



JEAN

FIGURE 701. Actual size reproduction of roentgenogram of hip.  
Chronological age 79 months.



JEAN

FIGURE 702. Actual size reproduction of roentgenogram of left knee.  
Chronological age 79 months.



JEAN

FIGURE 703. Actual size reproduction of roentgenogram of left knee.  
Chronological age 79 months.



JEAN

FIGURE 704. Actual size reproduction of roentgenogram of left foot.  
Chronological age 79 months.





JEAN

FIGURE 705. Actual size reproduction of roentgenogram of left foot.  
Chronological age 79 months.

MAYNARD

Maynard was 105 months old when he joined the group participating in the second study. Physical examination and prior medical history were essentially normal. He was given a psychological examination when 107 months old. On the Stanford-Binet test Maynard's M.A. was 100 months, I.Q. 93; on the Arthur Point Scale his M.A. was 150 months, I.Q. 140.

With adults Maynard was quiet but not unresponsive. However, he had difficulty in adjusting to the other members of the experimental group, two of the boys especially. For this reason after the first month Maynard was taken off the study and replaced by one of the alternates.

TABLE 383Maynard  
105 months

FOOD INTAKE  
*Values in grams per day*

DATE		DATE		DATE	
Food	10-5 to 11-4	Food	10-5 to 11-4	Food	10-5 to 11-4
Apple	100	Carrot	25	Peanut butter	16
Banana	100	Cheese, American	15	Potato	70
Beef, lean	100	Corn flakes	15	Salt	2
Bread, white	70	Egg, whole	50	Shredded wheat	15
Bread, whole wheat	30	Graham cracker	18	Sugar (average)	10
Butter	30	Lettuce	20	Tomato juice	60
Cabbage	25	Milk, fluid	400	Water (average)	460
		Orange concen- trate	50		

TABLE 384Maynard

HEIGHT AND WEIGHT RECORD\*

Age	Height	Weight	Age	Height	Weight	Age	Height	Weight
months	inches	pounds	months	inches	pounds	months	inches	pounds
7	—	11 <sup>7</sup> / <sub>8</sub>	34	—	26 <sup>1</sup> / <sub>8</sub>	100	48	53
8	—	12 <sup>1</sup> / <sub>2</sub>	37	—	24 <sup>1</sup> / <sub>4</sub>	104	49	53 <sup>1</sup> / <sub>2</sub>
8	—	12 <sup>1</sup> / <sub>4</sub>	41	—	27 <sup>1</sup> / <sub>2</sub>	107	49 <sup>1</sup> / <sub>2</sub>	57 <sup>3</sup> / <sub>4</sub>
10	—	14 <sup>5</sup> / <sub>8</sub>	45	—	29 <sup>1</sup> / <sub>4</sub>	110	50	61
11	—	16 <sup>1</sup> / <sub>2</sub>	49	—	31 <sup>1</sup> / <sub>4</sub>	114	50 <sup>1</sup> / <sub>2</sub>	60 <sup>1</sup> / <sub>2</sub>
15	—	19 <sup>1</sup> / <sub>8</sub>	52	—	30 <sup>1</sup> / <sub>2</sub>	116	50 <sup>1</sup> / <sub>4</sub>	62 <sup>1</sup> / <sub>2</sub>
18	—	19 <sup>5</sup> / <sub>8</sub>	55	—	31 <sup>3</sup> / <sub>4</sub>	119	51	64 <sup>1</sup> / <sub>2</sub>
19	—	19 <sup>1</sup> / <sub>4</sub>	56	—	32 <sup>1</sup> / <sub>2</sub>	146	56	79 <sup>3</sup> / <sub>4</sub>
22	—	20 <sup>7</sup> / <sub>8</sub>	60	40 <sup>1</sup> / <sub>4</sub>	35 <sup>1</sup> / <sub>2</sub>	154	57	84 <sup>3</sup> / <sub>4</sub>
24	—	20 <sup>7</sup> / <sub>16</sub>	66	41 <sup>1</sup> / <sub>4</sub>	36	161	58	93
27	—	22 <sup>1</sup> / <sub>4</sub>	72	42	38 <sup>1</sup> / <sub>2</sub>	173	62	112 <sup>3</sup> / <sub>4</sub>
29	—	23 <sup>7</sup> / <sub>8</sub>	83	44 <sup>3</sup> / <sub>4</sub>	46	183	64 <sup>1</sup> / <sub>4</sub>	128 <sup>1</sup> / <sub>2</sub>
31	—	23 <sup>3</sup> / <sub>4</sub>	92	46 <sup>1</sup> / <sub>4</sub>	46			

\* Clinical. See also table of recumbent lengths and weights.

TABLE 385

Maynard

## BLOOD DETERMINATIONS

Age	Date	Red cells	Hemo- globin †	WHITE BLOOD CELLS				
				Total	Poly- morpho- nuclears	Lym- pho- cytes	Mono- cytes	Eosino- philes
months	mo.-day	millions	gm./100 cc.	per c. mm.	per cent	per cent	per cent	per cent
104	9-18	5.01	12	7100	36	50	11	3
*107	12-4	4.74	15	—	—	—	—	—
110	3-18	4.53	13	8300	43	38	16	3
107	12-4	Hematocrit		RED BLOOD CELL MEASUREMENTS				
				Volume	Weight	Diameter	Thickness	
		per cent	c.μ	μμg.	μ	μ		
		42	88	96	7.2	2.2		
		MINERALS (mg. per 100 ml.)		NITROGEN (mg. per 100 ml.)				
104 107	9-16 12-4	SERUM		Plasma		Red Cells		
		Calcium	Phosphorus					
		9.62	3.81	—	—			
		—	—	1245	5200			
		PLASMA LIPID (mg. per 100 ml.)						
107	12-4	Total lipid	Phos- pholipid	Neutral fat	CHOLESTEROL			
					Total	Free	Esters	
		333	98	45	122	24	166	
107	12-4	ERYTHROCYTE LIPID (mg. per 100 gm.)						
		375	235	23	101	77	40	
107	12-4	Resistance Hypotonic sodium chloride	Hemolysis	{	Beginning, per cent of NaCl		0.42	
					Complete, per cent of NaCl		0.26	
		Saponin	Hemolysis	{	Beginning, micrograms of saponin		10	
					Complete, micrograms of saponin		40	

\* Venous blood.

† Haden-Hausser hemoglobinometer.

TABLE 386

Maynard

## RECUMBENT LENGTH AND WEIGHT

Age	RECUMBENT LENGTH		Weight	Age	RECUMBENT LENGTH		Weight
	Total	Stem			Total	Stem	
mo.-days	cm.	cm.	kg.	mo.-days	cm.	cm.	kg.
104-21	123.8	—	24.29	110-14	127.6	69.5	26.00
105-6	—	—	23.45	111-4	—	—	26.40
105-11	—	—	23.48	111-29	128.1	69.8	—
105-13	—	—	23.49	113-10	—	69.2	27.08
105-17	124.5	67.5	23.26	114-12	128.6	68.8	27.77
105-25	—	—	23.34	116-13	128.7	70.2	27.74
106-0	—	—	23.23	117-13	130.0	70.1	28.10
106-3	125.4	68.3	—	118-17	130.3	70.6	28.06
107-4	125.7	68.6	24.72				

Actual values are averages of independent measurements by two workers. In calculating the smooth values given with the balance data the actual values given above were smoothed by three-point averaging and the resulting figures entered for their respective balance periods. Values for balance periods intervening between measurements were obtained by interpolation.

TABLE 387

Maynard

## BASAL METABOLISM MEASUREMENTS

Age	Date	Sur- face area*	Respi- ration	Pulse rate	Body temper- ature	Blood pres- sure	Basal metab- olism
months	mo.-day	sq.m.	per min.	per min.	°F	S/D†	Cal/24 hr.
105	10-14	0.908	19	74	98.6	—	1123
106	10-21	0.904	21	74	98.6	—	1114
106	11-6	0.908	20	72	98.6	82/60	1066
110	3-18	0.965	17	72	98.0	88/70	1191
112	5-3	0.974	17	64	98.5	88/64	1097

\* DuBois formula.

† Systolic/Diastolic.

TABLE 388

Maynard  
105 months

## IRON IN INTAKE, URINE AND FECES

Values are averages per day

Date	Intake	Urine	Feces	Date	Intake	Urine	Feces	Date	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mo.-day	mg.	mg.	mg.	mo.-day	mg.	mg.	mg.
10-5	8.19	0.00	6.80	10-15	8.19	0.35	5.85	10-25	8.19	0.06	5.25
10-10	8.19	0.02	5.70	10-20	8.19	0.07	7.48	10-30	8.19	0.25	6.68

The age given is the initial age at start of study. Dates given are first days of five-day balance periods.

TABLE 389

Maynard  
105 months

BODY LENGTH AND WEIGHT—INTAKE AND ELIMINATION

Date	Recumbent length*	Weight*	INTAKE			AVERAGE DAILY HEAT OF COMBUSTION			FECES				
			AVERAGE DAILY						AVERAGE DAILY			Laxation rate‡	Elimination time§
			Dry wt.†	Total water†	Fat	In-take	Urine	Feces	Wet wt.	Dry wt.†	Fat		
mo.-day	cm.	kg.	gm.	gm.	gm.	Cal.	Cal.	Cal.	gm.	gm.	gm.		hours
10-5	124	23.74	360	1349	69.5	1883	68	91	120.6	18.0	1.4	2.8	6
10-10	124	23.47	367	1389	69.5	1908	—	54	67.0	11.0	1.1	1.6	53
10-15	124	23.41	374	1349	69.5	1935	73	53	77.6	12.0	1.4	1.2	48
10-20	124	23.36	361	1264	69.5	1885	76	59	54.8	13.0	1.6	1.2	48
10-25	125	23.28	359	1315	69.5	1879	72	58	69.6	10.0	1.1	1.2	30
10-30	125	23.76	360	1249	69.5	1882	—	50	61.4	11.0	1.2	1.2	48

The age given is the initial age at start of study. Dates given are first days of five-day balance periods. Italic figures were omitted from calculations of the average values given in Volume I.  
\* See Table 386 for actual values and method of smoothing.  
† Based on alcohol-dried food and oven-dried feces.  
‡ Drinking water plus water in foods.  
§ Average number of defecations per day.  
§ Elapsed time between ingestion and defecation of marker used to separate feces of five-day periods

TABLE 390

Maynard  
105 months

NITROGEN AND NEGATIVE MINERALS IN INTAKE, URINE, FECES  
*Values are averages per day*

Date	NITROGEN			PHOSPHORUS			CHLORINE			SULFUR		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
10-5	10.32	8.69	1.16	1076	550	431	3412	2984	16	692	543	92
10-10	10.32	9.47	0.78	1076	619	349	3412	3157	11	692	630	57
10-15	10.32	9.20	0.82	1076	461	394	3412	3320	3	692	673	55
10-20	10.32	9.57	0.67	1076	644	453	3412	3257	3	692	652	52
10-25	10.32	9.18	0.81	1076	660	409	3412	3162	5	692	641	57
10-30	10.32	9.49	0.82	1076	635	356	3412	3227	8	692	649	50

TABLE 391

Maynard  
105 months

POSITIVE MINERALS IN INTAKE, URINE, FECES  
*Values are averages per day*

Date	CALCIUM			MAGNESIUM			SODIUM			POTASSIUM		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
10-5	767	117	539	266	67	170	2176	1935	37	2440	1773	383
10-10	767	146	448	266	55	138	2176	1943	00	2440	1955	328
10-15	767	134	536	266	81	171	2176	2140	22	2440	2131	348
10-20	767	125	512	266	61	93	2176	2043	15	2440	1944	250
10-25	767	124	535	266	61	123	2176	2120	26	2440	1910	283
10-30	767	100	481	266	62	148	2176	2033	23	2440	2009	321



TABLE 392

Maynard  
105 months

## COMPLEX CARBOHYDRATES IN INTAKE AND FECES

*Values in grams per day*

Date	LIGNIN		CELLULOSE		HEMICELLULOSE		
	Intake	Feces	Intake	Feces	INTAKE		Feces
					Total	Stable	
10-5	1.33	1.27	2.32	2.26	2.47	1.89	1.16
10-10	1.33	0.85	2.32	1.42	2.47	1.89	0.52
10-15	1.33	0.96	2.32	0.65	2.47	1.89	0.81
10-20	1.33	1.46	2.32	0.60	2.47	1.89	0.94
10-25	1.33	1.10	2.32	0.44	2.47	1.89	0.67
10-30	1.33	1.18	2.32	0.48	2.47	1.89	0.69

TABLE 393

Maynard

## ANTHROPOMETRIC MEASUREMENTS

*Values in centimeters*

Age*	BREADTH			LENGTH		WIDTH	
	Biacro- mial	Intertro- chanteric	Inter- cristal	Tibia	Head	Chest	Head
106	23.4	22.0	21.5	26.9	19.6	19.0	13.8
107	25.5	21.7	20.9	27.4	19.7	19.1	13.7
108	24.0	22.0	21.0	27.5	19.5	19.0	13.6
110	25.1	22.5	21.3	27.5	19.6	19.3	13.7
111	25.0	23.3	21.6	28.2	20.0	18.8	13.7
112	25.0	22.7	21.2	27.7	19.7	19.3	13.7
113	25.8	22.7	21.5	28.7	19.9	19.3	14.0
114	25.3	22.8	21.6	28.4	19.1	19.7	13.7
116	25.9	22.4	21.8	29.0	19.6	20.0	13.8
117	26.2	23.4	22.0	28.8	19.7	20.0	13.8
118	26.2	23.1	22.0	28.8	19.4	19.7	13.8

Age*	DEPTH	CIRCUMFERENCES				
		Head	Chest	Thigh	Abdomen	Upper arm
	Chest					
106	14.3	54.0	54	34	55	16.0
107	14.0	54.3	56	34	57	16.4
108	14.0	54.0	58	35	56	17.0
110	14.2	54.2	56	35	55	17.0
111	13.6	54.6	56	38	58	17.5
112	13.5	54.2	58	37	55	17.5
113	13.7	54.0	58	35	58	17.0
114	14.0	54.6	60	36	61	17.4
116	13.7	54.0	57	36	57	17.5
117	14.0	54.0	60	37	60	18.0
118	14.5	54.5	60	38	57	17.5

\* Months.

TABLE 394

Maynard

## MEASUREMENTS OF THE BONES OF THE WRIST

AGE, months	54	65	104	110
CARPALS				
AREA, sq. mm.				
Hamate	37	52	95	103
Capitate	66	92	172	184
Lesser Multangular			31	38
Greater Multangular			36	47
Navicular			22	35
Lunate			46	56
Triangular		4	50	59
GREATEST DIAMETER, mm.				
Hamate	8	10	14	14
Capitate	11	13	19	20
Lesser Multangular			7	8
Greater Multangular			8	9
Navicular			7	8
Lunate			10	10
Triangular		2	10	11
Epiphyses				
1st Metacarpal	4	4	8	9
2nd Metacarpal	6	7	8	8
3rd Metacarpal	6	7	9	9
4th Metacarpal	4	6	7	7
ULNA				
DIAMETER, mm.				
Distal epiphysis	1	1	9	10
Distal metaphysis	10	12	12	12
RADIUS				
DIAMETER, mm.				
Distal epiphysis	12	15	22	23
WRIST AREA,* sq. mm.	806	950	1244	1296

\* Measured with the planimeter using Flory's landmarks (Monographs of the Society for Research in Child Development, Vol. I, No. 3, 1936).

TABLE 395

Maynard

## SKELETAL MATURATION

Values in months

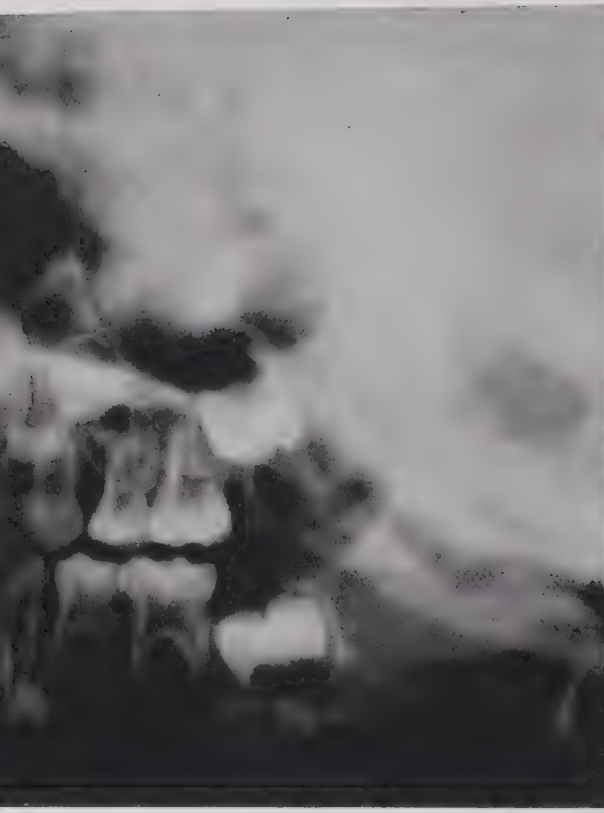
Chrono- logical age	HAND				FOOT	ELBOW	KNEE	HIP	SHOULDER	AVERAGE
	B.B.G.*	Flory†	Kelly‡	Todd§	Todd§	Todd§	Todd§	Todd§	Todd§	Todd§
54	33	20	<72	41	—	39	—	—	—	40
65	39	24	<72	48	—	50	—	—	—	49
104	90	73	100	88	93	90	93	101	99	94
110	98	79	103	91	100	93	97	103	100	97

\* Baldwin, B. T., Busby, L. M., Garside, H. V. Anatomic growth of children. University of Iowa Studies in Child Welfare, vol. 4, no. 1, 1928.

† Flory, C. D. Osseous development in the hand as an index of skeletal development. Monographs of the Society for Research in Child Development, vol. 1, no. 3, 1936.

‡ Kelly, H. J. Anatomic age and its relation to stature. University of Iowa Studies in Child Welfare, vol. 12, no. 5, 1937. No standards less than 72 months.

§ Determined by T. Wingate Todd, C. C. Francis, and Idell Pyle, Western Reserve University, Cleveland.



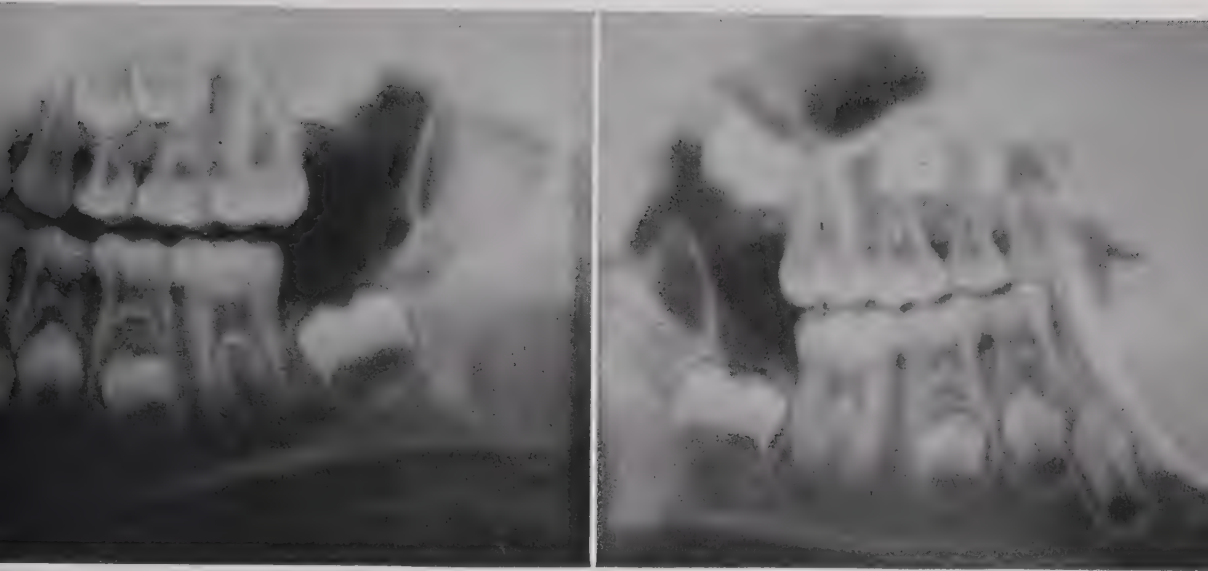
MAYNARD

FIGURE 706. Actual size reproduction of roentgenogram of jaws.  
Chronological age 54 months.



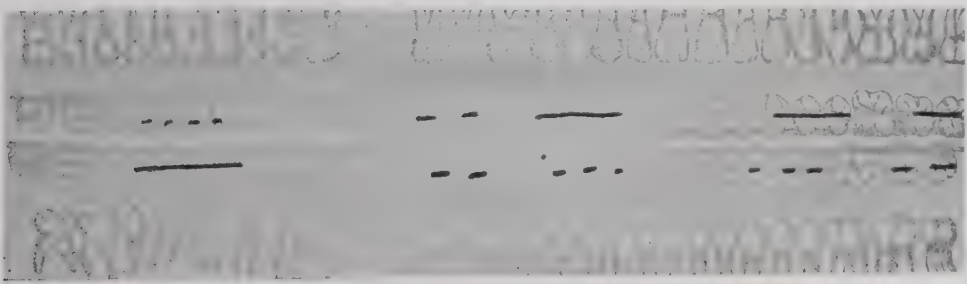
MAYNARD

FIGURE 707. Actual size reproduction of roentgenogram of jaws.  
Chronological age 65 months.



## MAYNARD

FIGURE 708. Actual size reproduction of roentgenogram of jaws.  
Chronological age 107 months.



## MAYNARD

FIGURE 709. Dental examination, age 112 months.



MAYNARD

FIGURE 710. Actual size reproduction of roentgenogram of left hand.  
Chronological age 54 months.





MAYNARD

FIGURE 711. Actual size reproduction of roentgenogram of left hand.  
Chronological age 65 months.



MAYNARD

FIGURE 712. Actual size reproduction of roentgenogram of left hand.  
Chronological age 104 months.



MAYNARD

FIGURE 713. Actual size reproduction of roentgenogram of left hand.  
Chronological age 110 months.

## CHARLDINE

Charldine weighed 9 pounds at birth and was breast-fed for 3 months. During her first four years she had whooping cough, measles and mumps without any apparent residual effects. At the time the first study was started she was 65 months old. One of her two older sisters (Josephine) also participated in the study. Physical examination was entirely negative. Charldine had been tested when she was 48 months old. On the Stanford-Binet test her M.A. was 46 months, I.Q. 96. The examiner stated:

Charldine is an attractive, alert child with dark hair, snappy dark eyes, and roguish smile. She was extremely friendly and sociable and was anxious to "play" the examiner's "games," which the latter had previously played with another child in the boarding home. Throughout the examination she was well-poised, co-operative and good natured. She was quite spontaneous in her reactions and conversation, but was reasonably persistent in her attention to the test material. She made frequent bids for the help and approval of the examiner.

TABLE 396

Charldine  
65 months

### FOOD INTAKE *Values in grams per day*

Food	DATE			Food	DATE		
	3-24 to 5-18	5-18 to 6-7	6-7 to 6-27		3-24 to 5-18	5-18 to 6-7	6-7 to 6-27
Apple	100	100	100	Egg, whole	50	50	50
Banana	100	100	100	Lettuce	20	20	20
Beef, lean	60	60	60	Milk, fluid	400	1000	400
Bread, white	60	60	60	Whole orange	100	100	100
Bread, whole wheat	30	30	30	Potato	70	70	70
Butter	30	30	30	Salt	2	2	2
Cabbage	25	25	25	Shredded wheat	30	30	30
Carrot	25	25	25	Sugar (average)	74	73	78
Celery	20	20	20	Canned tomato	60	60	60
Cheese, American	15	15	15	Water (average)	511	596	652



TABLE 397  
Charldine  
MEASUREMENTS OF THE BONES  
OF THE WRIST

AGE, months	56	66
CARPALS		
AREA, sq. mm.		
Hamate	62	78
Capitate	94	124
Lesser Multangular	10	25
Greater Multangular	23	38
Navicular	8	28
Lunate	22	41
Triangular	29	43
GREATEST DIAMETER, mm.		
Hamate	11	13
Capitate	14	16
Lesser Multangular	4	6
Greater Multangular	6	8
Navicular	3	7
Lunate	6	8
Triangular	6	9
Epiphyses		
1st Metacarpal	6	8
2nd Metacarpal	7	9
3rd Metacarpal	6	9
4th Metacarpal	6	8
ULNA		
DIAMETER, mm.		
Distal epiphysis	0	0
Distal metaphysis	11	12
RADIUS		
DIAMETER, mm.		
Distal epiphysis	14	19
WRIST AREA,* sq. mm.	792	929

\* Measured with the planimeter using Flory's landmarks (Monographs of the Society for Research in Child Development, Vol. I, No. 3, 1936.)

TABLE 398  
Charldine  
RECUMBENT LENGTH AND  
WEIGHT

Age	Recumbent length	Weight
mo.-days	cm.	kg.
64-18	—	17.47
64-23	106.7	17.55
64-24	—	17.70
64-27	—	17.86
65-1	—	17.72
65-7	—	18.21
65-11	—	17.94
65-16	107.3	18.00
65-21	—	18.12
65-26	—	18.14
66-2	—	18.42
66-6	—	18.42
66-11	—	18.41
66-16	—	18.32
66-21	—	18.97
66-25	107.7	—
66-26	—	19.06
67-2	—	19.24
67-6	—	19.14
67-11	—	19.23
67-16	—	19.10
67-21	—	19.20
67-28	109.4	—
67-29	—	19.09

Actual values are averages of independent measurements by two workers. In calculating the smooth values given with the balance data the actual values given above were smoothed by three-point averaging and the resulting figures entered for their respective balance periods. Values for balance periods intervening between measurements were obtained by interpolation.

TABLE 399  
Charldine  
BLOOD DETERMINATIONS

Age	Date	Red cells	Hemo-globin*	WHITE BLOOD CELLS				
				Total	Poly-morpho-nuclears	Lym-phocytes	Mono-cytes	Eosino-philés
months	mo.-day	millions	gm./100 cc.	per c. mm.	per cent	per cent	per cent	per cent
68	6-28	4.08	13	7200	55	39	6	0
MINERALS (mg. per 100 ml.)								
Serum calcium				Serum phosphorus				
66	4-21	11.0			4.9			

\* Newcomer method.



TABLE 400

Charldine  
65 months

## BODY LENGTH AND WEIGHT—INTAKE AND ELIMINATION

Date	Recum- bent length*	Weight*	INTAKE		AVERAGE DAILY HEAT OF COMBUSTION		FECES			Laxation rate†
			AVERAGE DAILY		Intake	Feces	AVERAGE DAILY			
			Dry wt.‡	Total water†			Wet wt.	Dry wt.‡	Fat	
mo.-day	cm.	kg.	gm.	gm.	Cal.	Cal.	gm.	gm.	gm.	
3-24§	107	17.57	387	1339	1820		209.5	21.5	—	2.5
3-29§	107	17.63	376	1260	1789		164.1	19.4	—	2.7
4-3§	107	17.79	376	1294	1785	100	150.7	19.4	2.3	2.4
4-8	107	17.85	368	1390	1806	102	149.8	19.2	2.6	2.6
4-13	107	17.90	384	1484	1781	94	148.8	17.8	2.2	2.6
4-18	107	17.97	370	1388	1786	90	151.6	19.0	2.6	2.6
4-23	107	18.03	411	1276	1932	103	154.6	22.2	2.3	3.0
4-28	107	18.10	374	1409	1843	98	155.6	20.6	2.4	3.0
5-3	107	18.20	391	1506	1839	96	158.2	20.0	2.2	3.0
5-8	108	18.23	371	1418	1828	92	136.8	18.6	2.3	2.4
5-13	108	18.27	379	1581	1857	83	134.2	19.4	2.3	2.4
5-18	108	18.30	438	1724	2163	103	163.8	22.6	2.7	2.8
5-23	108	18.80	460	2069	2268	96	145.4	22.4	2.0	2.6
5-28	108	19.20	448	2086	2269	111	173.6	22.2	2.8	2.6
6-2	108	19.20	452	2193	2233	112	164.0	22.6	2.5	2.4
6-7	109	19.20	366	1509	1808	94	139.0	19.0	2.6	2.6
6-12	109	19.20	363	1475	1836	77	116.2	16.8	2.4	1.6
6-17	109	19.20	373	1655	1874	88	110.8	17.4	2.2	2.0
6-22	110	19.20	371	1603	1835	80	98.8	15.4	1.9	1.6

The age given is the initial age at start of study. Dates given are first days of five-day balance periods.

\* See Table 398 for actual values and method of smoothing.

† Based on alcohol-dried food and oven-dried feces.

‡ Drinking water plus water in foods.

§ Average number of defecations per day.

¶ The interval from 3-24 to 4-8 actually consisted of two three-day periods, a four-day, and a five-day period. To achieve consistency among the balance periods the daily averages for the 15-day interval have been re-averaged on the basis of three five-day periods.

TABLE 401

Charldine  
66 months

## ORAL EXAMINATION

General mouth condition is fair. The mandibular gum tissue is hyperemic, the maxillary, anemic. No hypoplastic or malacotic teeth. There is a slight upper anterior spacing, medium lower anterior. Bite is a medium overlap with an upper protrusion. There are black stains on the teeth. The occlusion is normal. Attrition is slight on upper anteriors and canines, lower anteriors and posteriors. Attrition is medium on lower canines. Except for a few developmental pits, no active caries is present. General oral condition is good.

(Upon re-examination one and one-half months later the lower right central deciduous incisor had been exfoliated and the permanent incisor one-half erupted. General oral condition was good.)

TABLE 402

Charldine  
65 monthsNITROGEN AND NEGATIVE MINERALS IN INTAKE, URINE, FECES  
*Values are averages per day*

Date	NITROGEN			PHOSPHORUS			CHLORINE			SULFUR		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
3-24§	8.43	6.16	1.31	1348	501	428	3273	2810	168	724	413	119
3-29§	8.43	6.26	1.28	1348	534	445	3273	2983	131	724	421	104
4-3§	8.43	6.35	1.20	1348	545	457	3273	3018	120	724	422	101
4-8	8.43	7.06	1.25	1348	534	462	3515	3208	104	724	443	104
4-13	8.43	7.38	1.37	1348	592	469	3515	3350	102	724	480	84
4-18	8.43	7.23	1.04	1348	549	453	3515	3251	125	724	459	96
4-23	8.43	6.70	1.15	1348	511	494	3515	3373	139	724	427	110
4-28	8.43	6.65	1.08	1348	538	513	3515	2692	136	724	457	100
5-3	8.43	6.51	0.97	1348	513	464	3515	2844	108	724	415	92
5-8	8.43	6.25	1.01	1348	406	421	3515	2826	92	724	402	89
5-13	8.43	6.51	1.19	1348	539	476	3515	2868	95	724	431	96
5-18	11.22	8.67	1.27	2089	729	648	4181	3482	108	907	545	111
5-23	11.22	8.44	1.19	2089	633	705	4181	3476	104	907	548	112
5-28	11.22	9.03	1.19	2089	808	823	4181	3866	132	907	583	110
6-2	11.22	9.82	1.26	2089	858	758	4181	4020	101	907	612	112
6-7	8.43	7.20	1.18	1348	687	525	3515	3144	95	724	469	101
6-12	8.43	6.65	1.09	1348	643	491	3515	2838	93	724	442	94
6-17	8.43	6.20	1.04	1348	522	503	3515	2586	75	724	406	93
6-22	8.43	6.55	1.11	1348	551	410	3515	3008	57	724	449	78

§ See footnotes to Table 400.

TABLE 403

Charldine

## SKELETAL MATURATION

*Values in months*

Chrono- logical age	HAND			ELBOW	AVERAGE
	B.B.G.*	Flory†	Todd‡	Todd‡	Todd‡
56	63	48	47	45	46
66	77	62	59	57	58

\* Baldwin, B. T., Busby, L. M., Garside, H. V. Anatomic growth of children. University of Iowa Studies in Child Welfare, vol. 4, no. 1, 1928.

† Flory, C. D. Osseous development in the hand as an index of skeletal development. Monographs of the Society for Research in Child Development, vol. 1, no. 3, 1936.

‡ Determined by T. Wingate Todd, and C. C. Francis, Western Reserve University, Cleveland.

TABLE 404

Charldine  
65 months

POSITIVE MINERALS IN INTAKE, URINE, FECES  
*Values are averages per day*

Date	CALCIUM			MAGNESIUM			SODIUM			POTASSIUM		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
3-24§	991	106	1170	310	78	161	2155	1048	251	2324	2648	614
3-29§	991	127	946	310	80	151	2155	1195	190	2324	2587	509
4-3§	991	124	900	310	80	151	2155	1233	176	2324	2403	498
4-8	991	111	628	310	79	162	2312	1424	152	2324	2277	461
4-13	991	121	611	310	69	146	2312	1376	155	2324	2638	484
4-18	991	102	606	310	91	142	2312	1260	190	2324	2252	550
4-23	991	118	669	310	90	159	2312	1559	199	2324	2132	640
4-28	991	78	633	310	74	160	2312	1492	185	2324	2052	574
5-3	991	93	593	310	76	158	2312	1442	167	2324	1907	573
5-8	991	91	573	310	85	135	2312	1465	144	2324	1929	510
5-13	991	88	661	310	90	160	2312	1349	132	2324	1656	498
5-18	1889	140	1178	399	93	185	2665	2101	157	3488	2924	540
5-23	1889	138	1211	399	99	182	2665	1975	132	3488	2557	572
5-28	1889	160	1162	399	100	178	2665	1841	171	3488	2420	596
6-2	1889	168	1219	399	106	167	2665	2091	136	3488	2320	570
6-7	991	101	636	310	92	141	2312	1632	150	2324	2118	452
6-12	991	103	610	310	90	145	2312	1496	126	2324	1660	453
6-17	991	87	611	310	82	141	2312	1286	105	2324	1956	453
6-22	991	119	535	310	85	129	2312	1561	72	2324	2001	420

§ See footnotes to Table 400.

TABLE 405

Charldine

HEIGHT AND WEIGHT RECORD\*

Age	Height	Weight	Age	Height	Weight
months	inches	pounds	months	inches	pounds
45	36 <sup>3</sup> / <sub>4</sub>	29 <sup>1</sup> / <sub>4</sub>	60	—	38 <sup>3</sup> / <sub>4</sub>
51	—	32 <sup>1</sup> / <sub>4</sub>	62	—	38
56	35 <sup>1</sup> / <sub>4</sub>	40	63	42	38 <sup>1</sup> / <sub>2</sub>

\* Clinical. See also table of recumbent lengths and weights.



CHARLDINE  
FIGURE 714. Postural footprints, age 68 months.

## NITROGEN PARTITION OF URINE

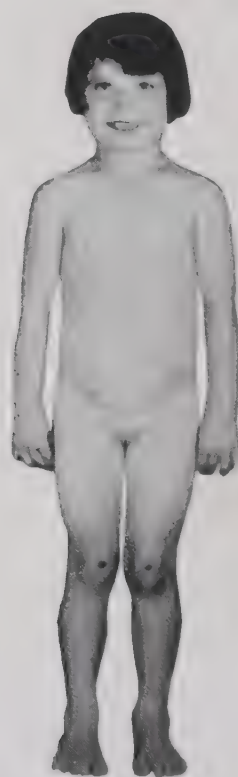
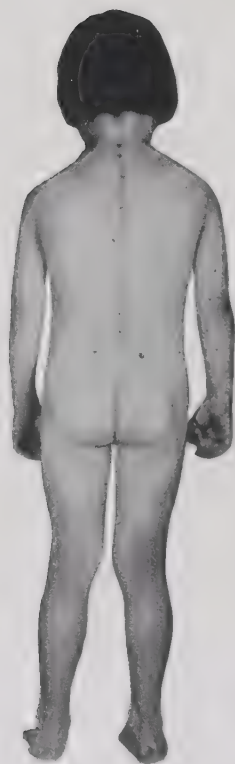
*Values in grams of nitrogen per day*

Date	Total nitrogen	Urea	Ammonia	Creatinine + Creatine	Creatinine	Uric acid
3-30	6.72	6.25	0.128	0.256	0.172	0.120
3-31	6.21	5.97	0.179	0.224	0.164	0.100
4-1	5.62	5.21	0.202	0.256	0.170	0.053
4-2	7.23	6.39	0.179	0.248	0.207	0.060
4-3	6.61	5.00	0.168	0.272	0.202	0.107
4-4	6.51	5.99	0.177	0.270	0.168	0.108
4-5	5.99	5.66	0.202	0.273	0.153	0.102
4-6	6.08	5.45	0.198	0.357	0.147	0.111
4-7	6.18	5.69	0.191	0.249	0.143	0.076
4-8	7.12	5.92	0.148	0.275	0.152	0.114
4-9	6.74	5.59	0.187	0.233	0.154	0.109
4-10	6.77	5.86	0.190	0.287	0.202	0.142
4-11	7.03	5.81	0.184	0.263	0.151	0.122
4-12	7.64	6.01	0.229	0.278	0.174	0.103
4-13	7.86	6.40	0.194	0.239	0.190	0.045
4-14	6.92	4.88	0.195	0.242	0.145	0.130
4-15	6.80	5.70	0.170	0.215	0.142	0.119
4-16	8.03	5.22	0.201	0.273	0.183	0.128
4-17	7.29	5.83	0.138	0.274	0.177	0.121
4-18	6.65	5.22	0.198	0.201	0.155	0.100
4-19	7.09	5.38	0.190	0.273	0.177	0.121
4-20	7.80	6.31	0.182	0.277	0.162	0.118
4-21	7.42	4.96	0.228	0.240	0.202	0.099
4-22	7.21	6.23	0.216	0.304	0.174	0.122
4-23	7.34	5.36	0.197	0.280	0.175	0.089
4-24	6.25	5.17	0.200	0.289	0.164	0.105
4-25	6.32	5.20	0.200	0.224	0.146	0.084
4-26	6.61	5.11	0.200	0.275	0.145	0.100
4-27	7.01	6.13	0.196	0.304	0.224	0.106
4-28	6.84	5.73	0.197	0.379	0.206	0.103
4-29	6.85	5.36	0.223	0.282	0.186	0.107
4-30	7.58	6.51	0.292	0.215	0.166	0.121
5-1	5.53	4.90	0.200	0.226	0.133	0.098
5-2	6.48	5.18	0.228	0.224	0.131	0.101
5-3	6.54	5.73	0.194	0.180	0.138	0.134
5-4	6.71	5.80	0.232	0.355	0.180	0.141
5-5	6.26	5.33	0.183	0.402	0.178	0.151
5-6	6.27	5.46	0.238	0.266	0.140	0.173
5-7	6.75	5.80	0.290	0.547	0.180	0.108
5-8	6.48	5.79	0.188	0.364	0.174	0.129
5-9	5.17	4.42	0.232	0.266	0.124	0.103
5-10	6.01	5.22	0.164	0.364	0.154	0.108
5-11	6.65	5.82	0.184	0.517	0.184	0.117
5-12	6.92	6.00	0.242	0.392	0.149	0.126
5-13	6.83	5.90	0.190	0.463	0.193	0.133
5-14	6.60	5.70	0.231	0.554	0.246	0.119
5-15	6.92	6.08	0.210	0.428	0.182	0.145
5-16	6.04	5.20	0.209	0.454	0.182	0.111
5-17	6.14	5.33	0.212	0.463	0.192	0.120
5-18	7.66	6.34	0.233	0.437	0.160	0.129
5-19	—	—	0.196	0.386	0.179	0.149
5-20	8.44	7.18	0.303	0.449	0.196	0.164
5-21	9.04	6.62	0.263	0.434	0.216	0.138
5-22	9.48	7.89	0.269	0.465	0.237	0.185
5-23	7.75	6.88	0.231	0.425	0.158	0.147
5-24	8.27	7.48	0.202	0.379	0.153	0.111
5-25	8.48	7.29	0.222	0.486	0.192	0.140
5-26	8.93	7.46	0.146	0.499	0.251	0.124
5-27	8.74	6.97	0.224	0.581	0.175	0.128
5-28	8.17	7.10	0.200	0.422	0.199	—
5-29	8.97	7.79	0.277	0.556	0.209	0.136

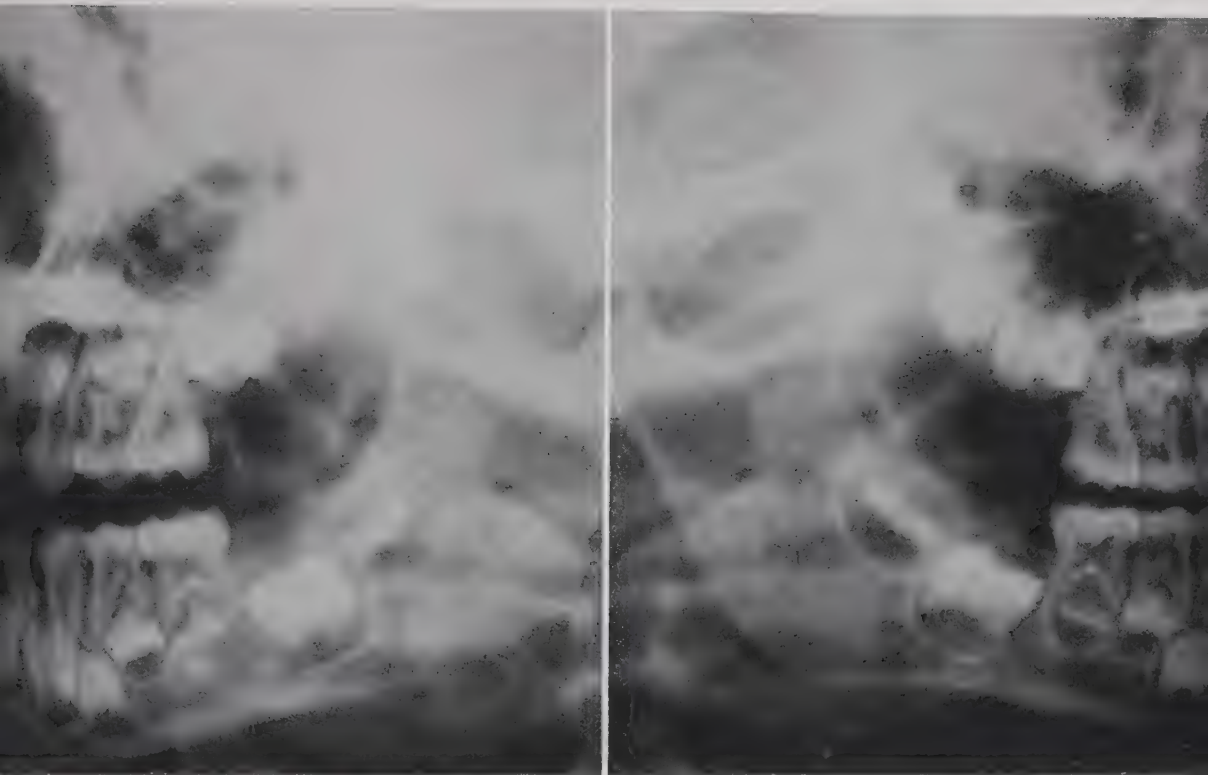




FIGURE 715. CHARLDINE  
Age 65 months

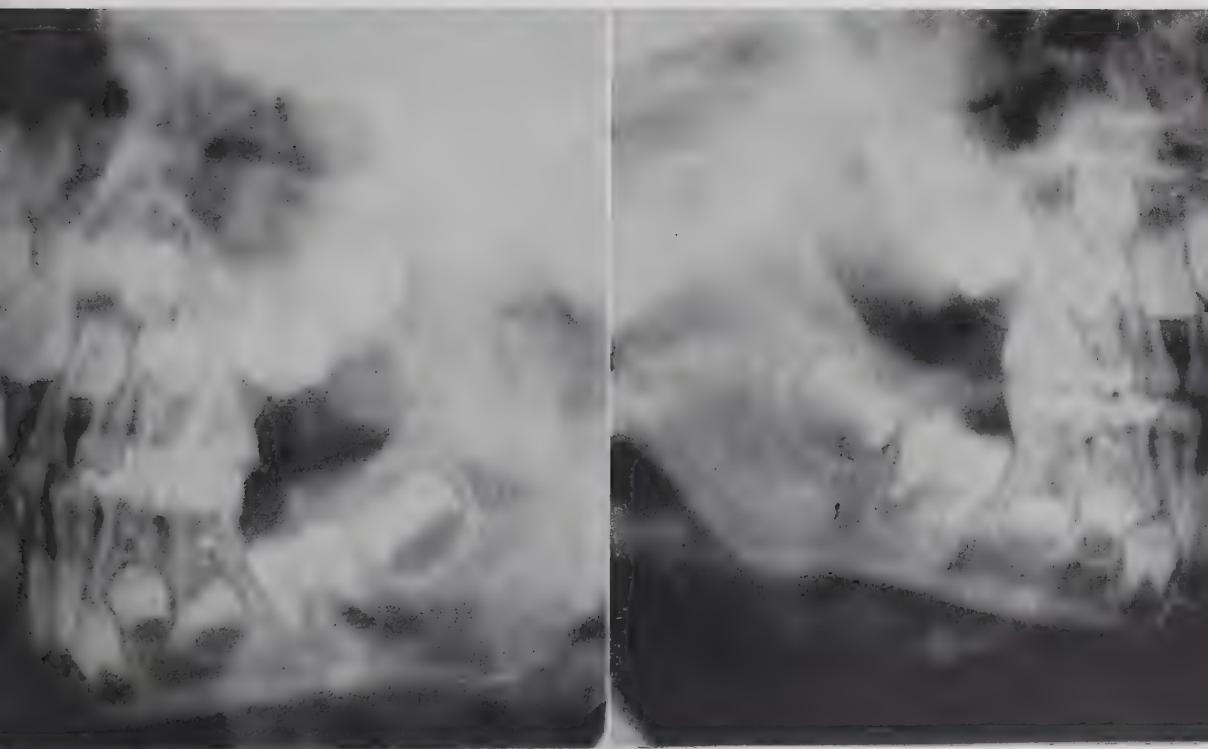






CHARLDINE

FIGURE 716. Actual size reproduction of roentgenogram of jaws.  
Chronological age 56 months.



CHARLDINE

FIGURE 717. Actual size reproduction of roentgenogram of jaws.  
Chronological age 66 months.



CHARLDINE

FIGURE 718. Actual size reproduction of roentgenogram of left hand.  
Chronological age 56 months.



## CHARLDINE

FIGURE 719. Actual size reproduction of roentgenogram of left hand.  
Chronological age 66 months.

## JOSEPHINE

Josephine was 106 months old when she entered the study group. Her medical history was negative except for minor illnesses. Physical examination prior to the study showed nothing abnormal. One of her two younger sisters (Charldine) was also in the study group. Josephine had been tested when she was 86 months old. On the Stanford-Binet test her M.A. was 84 months, I.Q. 98. The examiner commented:

Josephine is a round checked little girl with blue eyes and light brown hair cut in a Dutch bob. She is attractive, alert, spontaneous and friendly. There was no timidity or repression but neither was she boisterous or aggressive. During the course of the examination she became increasingly restless as the tests increased in difficulty until examiner relieved the situation by engaging her in conversation for awhile and allowing her to perform her stunt. After this she settled down readily to a completion of the test. She was rather easily distracted by outside noises and by people passing the window. She was very friendly, was anxious to play with the large Indian doll in the room, and offered to get a pair of shoes, which she had and were too large for her own doll, for this doll which is barefoot.

TABLE 407

Josephine

### BLOOD DETERMINATIONS

Age	Date	Red cells	Hemo-globin*	WHITE BLOOD CELLS				
				Total	Poly-morpho-nuclears	Lym-pho-cytes	Mono-cytes	Eosino-philés
months	mo.-day	millions	gm./100 cc.	per c. mm.	per cent	per cent	per cent	per cent
108	6-28	4.06	14	6900	53	40	5	2
MINERALS (mg. per 100 ml.)								
Serum calcium				Plasma phosphorus				
107	5-19	9.5			5.7			

\* Newcomer method.



TABLE 408 Josephine  
RECUMBENT LENGTH AND  
WEIGHT

Age	Recumbent length	Weight
mo.-days	cm.	kg.
106-3	128.3	25.49
106-7	—	25.12
106-12	—	25.71
106-17	—	25.35
106-22	—	25.49
106-26	129.0	—
106-27	—	25.25
107-3	—	25.54
107-7	—	25.50
107-12	—	25.82
107-17	—	25.56
107-22	—	25.75
107-29	129.6	—
108-0	—	25.66

Actual values are averages of independent measurements by two workers. In calculating the smooth values given with the balance data the actual values given above were smoothed by three-point averaging and the resulting figures entered for their respective balance periods.

TABLE 410 Josephine  
HEIGHT AND WEIGHT RECORD

Age	Height	Weight
months	inches	pounds
85	45 $\frac{3}{4}$	43 $\frac{1}{2}$
96	—	50
103	42 $\frac{3}{4}$	54 $\frac{3}{4}$
105	50	57 $\frac{3}{4}$
109	51	58 $\frac{1}{4}$
113	51 $\frac{1}{2}$	62 $\frac{1}{2}$

TABLE 409 Josephine  
MEASUREMENTS OF THE BONES  
OF THE WRIST

AGE, months	96	107
CARPALS		
AREA, sq. mm.		
Hamate	102	119
Capitate	179	200
Lesser Multangular	44	54
Greater Multangular	60	72
Navicular	55	70
Lunate	54	70
Triangular	67	82
GREATEST DIAMETER, mm.		
Hamate	15	16
Capitate	20	20
Lesser Multangular	8	9
Greater Multangular	10	11
Navicular	10	11
Lunate	10	12
Triangular	11	13
Epiphyses		
1st Metacarpal	8	9
2nd Metacarpal	10	11
3rd Metacarpal	9	10
4th Metacarpal	7	9
ULNA		
DIAMETER, mm.		
Distal epiphysis	4	8
Distal metaphysis	12	14
RADIUS		
DIAMETER, mm.		
Distal epiphysis	22	23
WRIST AREA,* sq. mm.	1054	1187

\* Measured with the planimeter using Flory's landmarks (Monographs of the Society for Research in Child Development, Vol. I, No. 3, 1936).

TABLE 411 Josephine  
106 months

ORAL EXAMINATION

Condition of mouth fair, gums healthy. All upper permanent incisors and lower first permanent molars are malacotic. Bite is a medium overlap with an upper protrusion. Relation of first permanent molars normal on each side, but upper central incisors are rotated outward mesially. Attrition is marked on all deciduous canines and medium on deciduous posteriors. There are pits in all permanent first molars and a number of open cavities in the deciduous teeth, also some closed (filled) cavities. Teeth have black stains. General oral condition is fair.

(Except for improvement in general oral condition no changes were noted upon re-examination one and one-half months later. General oral condition was improved.)



TABLE 412

Josephine  
106 monthsFOOD INTAKE  
*Values in grams per day*

Food	DATE		Food	DATE	
	5-3 to 6-2	6-2 to 6-27		5-3 to 6-2	6-2 to 6-27
Apple	100	100	Egg, whole	50	50
Banana	100	100	Lettuce	20	20
Beef, lean	60	60	Milk, fluid	400	1000
Bread, white	60	60	Whole orange	100	100
Bread, whole wheat	30	30	Potato	70	70
Butter	30	30	Salt	2	2
Cabbage	25	25	Shredded wheat	30	30
Carrot	25	25	Canned tomato	60	60
Celery	20	20	Sugar (average)	111	63
Cheese, American	15	15	Water (average)	1190	1171

TABLE 413

Josephine  
106 months

## BODY LENGTH AND WEIGHT—INTAKE AND ELIMINATION

Date	Recum- bent Length*	Weight*	INTAKE		AVERAGE DAILY HEAT OF COMBUSTION		FECES			Laxation rate‡
			AVERAGE DAILY		Intake	Feces	AVERAGE DAILY			
			Dry wt.*	Total water†			Wet wt.	Dry wt.*	Fat	
mo.-day	cm.	kg.	gm.	gm.	Cal.	Cal.	gm.	gm.	gm.	
5-3	128	25.27	402	1886	1883	92	98.2	19.0	2.4	1.2
5-8	128	25.30	416	1636	2007	85	103.2	17.4	2.0	1.4
5-13	129	25.35	437	2103	2090	80	102.8	16.2	2.1	1.4
5-18	129	25.40	410	2049	1944	86		16.6	2.2	1.2
5-23	129	25.43	405	2317	1939	93	110.8	18.4	1.9	1.6
5-28	129	25.47	401	2543	1972	74	107.2	15.2	2.0	1.4
6-2	129	25.50	369	2362	1793	90	122.2	19.2	2.0	2.4
6-7	129	25.53	416	2370	2115	98	108.4	20.2	2.3	2.2
6-12§	129	25.55	444	2849	2269	104	123.8	21.0	2.2	1.6
6-17§	129	25.60	428	2477	2200	101	107.1	19.9	2.1	1.4
6-22	130	25.63	430	2422	2178	81	106.0	16.8	1.8	1.4

The age given is the initial age at start of study. Dates given are first days of five-day balance periods.

\* See Table 108 for actual values and method of smoothing.

† Based on alcohol-dried food and oven-dried feces.

‡ Drinking water plus water in foods.

§ Average number of defecations per day.

§ The interval from 6-12 to 6-22 actually consisted of one seven-day and one three-day period. To achieve consistency among the balance periods the daily averages for the 10-day interval have been reaveraged on the basis of two five-day periods.

TABLE 414

Josephine  
106 monthsNITROGEN AND NEGATIVE MINERALS IN INTAKE, URINE, FECES  
*Values are averages per day*

Date	NITROGEN			PHOSPHORUS			CHLORINE			SULFUR		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
5-3	8.43	5.46	1.00	1348	454	460	3515	2442	66	724	349	90
5-8	8.43	6.13	0.99	1348	366	428	3515	2666	56	724	360	87
5-13	8.43	7.04	0.92	1348	593	376	3515	2998	61	724	482	81
5-18	8.43	6.24	0.92	1348	603	434	3515	2714	17	724	405	82
5-23	8.43	6.47	1.06	1348	559	418	3515	3136	68	724	431	93
5-28	8.43	7.17	1.04	1348	522	380	3515	3498	48	724	478	76
6-2	11.22	9.18	1.35	2089	713	725	4181	3580	55	907	612	89
6-7	11.22	8.96	1.18	2089	788	786	4181	3787	31	907	583	87
6-12*	11.22	8.01	1.21	2089	808	677	4181	3393	52	907	518	95
6-17*	11.22	8.11	1.12	2089	727	728	4181	3094	35	907	522	88
6-22	11.22	8.33	0.96	2089	703	541	4181	3325	37	907	550	69

\* See footnotes to Table 413.

TABLE 415

Josephine  
106 monthsPOSITIVE MINERALS IN INTAKE, URINE, FECES  
*Values are averages per day*

Date	CALCIUM			MAGNESIUM			SODIUM			POTASSIUM		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
5-3	991	74	651	310	83	160	2312	1476	104	2324	1702	545
5-8	991	86	610	310	90	141	2312	1380	85	2324	1732	495
5-13	991	82	620	310	116	147	2312	1535	104	2324	2301	420
5-18	991	97	601	310	103	151	2312	1767	26	2324	1982	406
5-23	991	99	654	310	111	154	2312	1839	122	2324	2048	490
5-28	991	97	546	310	104	133	2312	1592	98	2324	2338	418
6-2	1889	140	1093	399	127	173	2665	1825	96	3488	2694	472
6-7	1889	130	1208	399	117	184	2665	1926	47	3488	3117	512
6-12*	1889	131	1134	399	114	186	2665	1732	114	3488	2488	486
6-17*	1889	134	1149	399	113	179	2665	1482	75	3488	2599	476
6-22	1889	153	961	399	110	140	2665	1754	79	3488	2510	420

\* See footnotes to Table 413.

TABLE 416

Josephine  
106 months

NITROGEN PARTITION OF URINE  
*Values in grams of nitrogen per day*

Date	Total nitrogen	Urea	Ammonia	Creatinine + Creatine	Creatinine	Uric acid
5-6	3.79	2.73	0.751	0.193	0.107	0.129
5-7	6.41	5.46	0.218	0.382	0.124	0.112
5-8	7.10	6.32	0.210	0.437	0.231	0.139
5-9	7.12	6.00	0.295	0.502	0.251	0.134
5-10	6.67	5.71	0.276	0.512	0.235	0.125
5-11	5.69	4.88	0.162	0.480	0.268	0.115
5-12	4.06	3.52	0.193	0.232	0.146	0.085
5-14	9.80	8.62	0.433	0.828	0.378	0.151
5-15	6.17	5.20	0.360	0.674	0.315	0.099
5-16	6.84	6.19	0.297	0.573	0.233	0.119
5-17	5.86	5.55	0.342	0.570	0.273	0.106

The age given is the initial age at start of study.

TABLE 417

Josephine

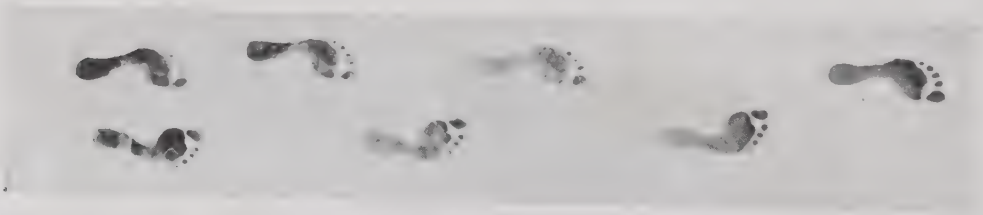
SKELETAL MATURATION  
*Values in months*

Chrono-logical age	HAND			ELBOW	AVERAGE
	B.B.G.*	Flory†	Todd‡	Todd‡	Todd‡
96	102	80	87	89	88
107	108	84	99	103	101

\* Baldwin, B. T., Busby, L. M., Garside, H. V. Anatomic growth of children. University of Iowa Studies in Child Welfare, vol. 4, no. 1, 1928.

† Flory, C. D. Osseous development in the hand as an index of skeletal development. Monographs of the Society for Research in Child Development, vol. 1, no. 3, 1936.

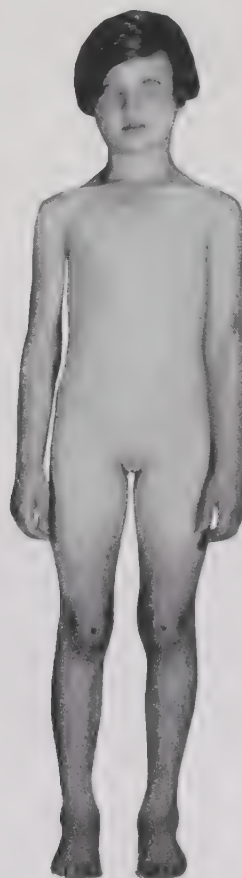
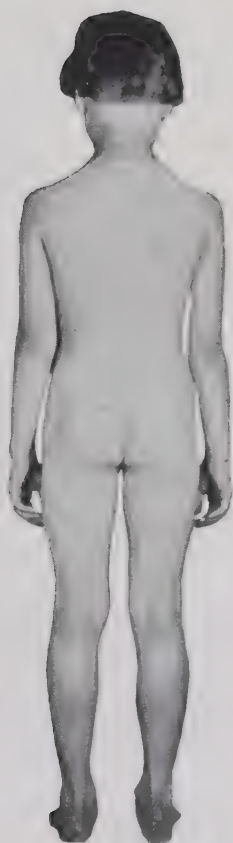
‡ Determined by T. Wingate Todd and C. C. Francis, Western Reserve University, Cleveland.



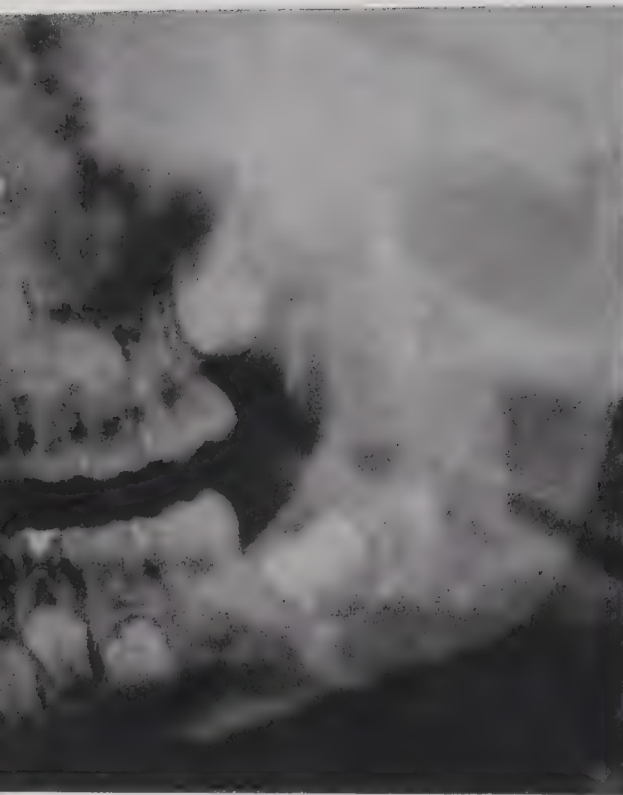
JOSEPHINE  
FIGURE 720. Postural footprints, age 108 months.



FIGURE 721. JOSEPHINE  
Age 106 months







JOSEPHINE

FIGURE 722. Actual size reproduction of roentgenogram of jaws.  
Chronological age 96 months.



JOSEPHINE

FIGURE 723. Actual size reproduction of roentgenogram of jaws.  
Chronological age 107 months.





JOSEPHINE

FIGURE 724. Actual size reproduction of roentgenogram of left hand.  
Chronological age 96 months.



JOSEPHINE

FIGURE 725. Actual size reproduction of roentgenogram of left hand.  
Chronological age 107 months.

## ROBERT

At the time he joined the study group Robert was 68 months old. His previous medical history and his physical examination were essentially negative. Psychological examination at 61 months had shown a M.A. of 70 months, I.Q. 115.

TABLE 418

Robert

### BLOOD DETERMINATIONS

Age	Date	Red cells	Hemoglobin*	WHITE BLOOD CELLS				
				Total	Poly-morpho-nuclears	Lym-pho-cytes	Mono-cytes	Eosino-philes
months	mo.-day	millions	gm./100 cc.	per c. mm.	per cent	per cent	per cent	per cent
71	6-28	4.38	13	8200	58	38	4	0
MINERALS (mg. per 100 ml.)								
Serum calcium				Plasma phosphorus				
69	4-21	10.1			5.4			

\* Newcomer method.

TABLE 419

Robert  
72 months

### ORAL EXAMINATION

General oral condition poor, teeth badly stained. Gums are healthy. No hypoplastic or malacotic teeth. There is a medium diastema between the upper deciduous central incisors, a slight diastema between the lowers. Bite is a slight overlap with an upper protrusion. Occlusion is normal. Attrition is medium on all canines and upper anteriors, slight on upper and lower posteriors. There are a few molar developmental pits and some open cavities. Upper left deciduous first molar has been extracted. Stains on teeth are black. General picture is fair, except for poor oral hygiene.

(Upon re-examination one and one-half months later all the deciduous teeth were still present. General oral condition was improved.)

TABLE 420

Robert  
68 monthsFOOD INTAKE  
*Values in grams per day*

Food	DATE		Food	DATE	
	4-13 to 5-18	5-18 to 6-27		4-13 to 5-18	5-18 to 6-27
Apple	100	100	Egg, whole	50	50
Banana	100	100	Lettuce	20	20
Beef, lean	60	60	Milk, fluid	400	1000
Bread, white	60	60	Whole orange	100	100
Bread, whole wheat	30	30	Potato	70	70
Butter	30	30	Salt	2	2
Cabbage	25	25	Shredded wheat	30	30
Carrot	25	25	Canned tomato	60	60
Celery	20	20	Sugar (average)	151	68
Cheese, American	15	15	Water (average)	566	438

TABLE 421 Robert  
RECUMBENT LENGTH AND  
WEIGHT

Age	Recumbent length	Weight
mo.-days	cm.	kg.
68-14	111.8	19.82
68-19	—	19.63
68-24	—	19.62
69-5	—	19.84
69-9	—	19.92
69-14	—	20.06
69-19	—	20.04
69-24	—	20.42
69-28	113.5	—
69-29	—	20.31
70-5	—	20.42
70-9	—	20.47
70-14	—	20.59
70-19	—	20.33
70-24	—	20.39
71-1	114.4	—
71-2	—	20.70

TABLE 423 Robert  
HEIGHT AND WEIGHT RECORD

Age	Height	Weight
months	inches	pounds
59	41 $\frac{3}{4}$	37 $\frac{3}{4}$
60	41	38 $\frac{3}{4}$
65	43 $\frac{1}{4}$	42 $\frac{1}{4}$
78	46 $\frac{1}{2}$	47 $\frac{1}{2}$
115	51	58 $\frac{3}{4}$

TABLE 422 Robert  
MEASUREMENTS OF THE BONES  
OF THE WRIST

AGE, months	60	70
CARPALS		
AREA, sq. mm.		
Hamate	57	72
Capitate	86	111
Lesser Multangular	8	23
Greater Multangular	16	35
Navicular	10	28
Lunate	16	31
Triangular	28	43
GREATEST DIAMETER, mm.		
Hamate	10	11
Capitate	13	15
Lesser Multangular	3	6
Greater Multangular	4	8
Navicular	4	7
Lunate	5	8
Triangular	6	8
Epiphyses		
1st Metacarpal	5	7
2nd Metacarpal	7	9
3rd Metacarpal	7	9
4th Metacarpal	6	8
ULNA		
DIAMETER, mm.		
Distal metaphysis	12	14
RADIUS		
DIAMETER, mm.		
Distal epiphysis	14	17
WRIST AREA,* sq. mm.	923	1061

\* Measured with the planimeter using Flory's landmarks (Monographs of the Society for Research in Child Development, Vol. I, No. 3, 1936).

BODY LENGTH AND WEIGHT—INTAKE AND ELIMINATION

Date	Recumbent length*	Weight*	INTAKE		AVERAGE DAILY HEAT OF COMBUSTION		FECES			
			AVERAGE DAILY		Intake	Feces	AVERAGE DAILY			Laxation rate‡
			Dry wt.*	Total water†			Wet wt.	Dry wt.*	Fat	
mo.-day	cm.	kg.	gm.	gm.	Cal.	Cal.	gm.	gm.	gm.	
4-13	112	19.65	468	1528	2116	89	83.0	17.4	2.7	1.0
4-18	112	19.70	464	1420	2163	99	89.2	18.8	2.4	0.8
4-23	112	19.80	475	1351	2191	89	80.6	17.0	2.2	1.0
4-28	112	19.85	439	1474	2104	104	94.6	20.6	2.4	1.2
5-8	113	20.00	447	1398	2130	94	120.4	18.2	2.2	1.6
5-13	113	20.07	435	1596	2080	89	74.2	17.0	1.8	1.0
5-18	113	20.13	469	1716	2286	112	105.4	23.0	2.4	1.0
5-23	114	20.20	467	1994	2293	97	—	19.4	2.0	0.8
5-28	114	20.28	452	1960	2285	100	83.6	19.2	2.0	0.8
6-2	114	20.33	443	1900	2197	107	94.0	21.6	2.1	1.0
6-7	114	20.40	415	1786	2111	99	—	19.4	2.1	1.0
6-17§	114	20.52	399	2002	2089	111	79.2	13.4	2.6	1.7
6-22	114	20.60	445	1709	2239	86	100.2	20.6	1.8	1.2

The age given is the initial age at start of study. Dates given are first days of five-day balance periods.  
\* See Table 421 for actual values.  
+ Based on alcohol-dried food and oven-dried feces.  
† Drinking water plus water in foods.  
‡ Average number of defecations per day.  
§ Three-day period.

NITROGEN AND NEGATIVE MINERALS IN INTAKE, URINE, FECES

Values are averages per day

Date	NITROGEN			PHOSPHORUS			CHLORINE			SULFUR		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
4-13	8.43	6.59	1.24	1348	635	406	3515	3908	42	724	542	99
4-18	8.43	6.32	0.93	1348	519	430	3515	2907	41	724	400	102
4-23	8.43	6.85	0.97	1348	549	347	3515	3378	39	724	440	94
4-28	8.43	6.81	1.18	1348	604	416	3515	3075	67	724	452	109
5-8	8.43	6.18	1.13	1348	488	428	3515	2883	59	724	415	94
5-13	8.43	6.56	1.00	1348	521	401	3515	2970	36	724	441	86
5-18	11.22	8.37	1.17	2089	734	620	4181	3189	58	907	535	108
5-23	11.22	8.36	1.13	2089	853	557	4181	3432	42	907	546	87
5-28	11.22	9.15	1.01	2089	908	533	4181	3830	44	907	593	99
6-2	11.22	8.77	1.16	2089	967	584	4181	3444	41	907	571	93
6-7	11.22	9.92	1.01	2089	1082	637	4181	3638	36	907	639	85
6-17*	11.22	9.95	1.24	2089	954	722	4181	3942	49	907	620	99
6-22	11.22	8.47	1.15	2089	851	595	4181	3306	45	907	552	93

\* See footnotes to Table 424.



TABLE 426

Robert  
68 months

POSITIVE MINERALS IN INTAKE, URINE, FECES  
*Values are averages per day*

Date	CALCIUM			MAGNESIUM			SODIUM			POTASSIUM		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
4-13	991	132	549	310	91	15	2312	1748	30	2324	2595	416
4-18	991	88	591	310	86	14	2312	1412	43	2324	2143	448
4-23	991	107	489	310	89	11	2312	1923	22	2324	2253	428
4-28	991	113	629	310	83	16	2312	1862	47	2324	1993	525
5-8	991	115	588	310	88	14	2312	1383	49	2324	1349	451
5-13	991	88	583	310	91	14	2312	1485	20	2324	2320	408
5-18	1889	110	1174	399	64	11	2665	1931	44	3488	2599	544
5-23	1889	116	1038	399	94	18	2665	2031	26	3488	1969	514
5-28	1889	128	1032	399	94	18	2665	1904	17	3488	2594	484
6-2	1889	117	1286	399	88	21	2665	1771	17	3488	2594	583
6-7	1889	125	1100	399	99	18	2665	1848	11	3488	3125	485
6-17*	1889	142	1170	399	93	18	2665	1989	19	3488	3029	599
6-22	1889	139	1060	399	93	17	2665	1681	16	3488	2158	553

\* See footnotes to Table 424.

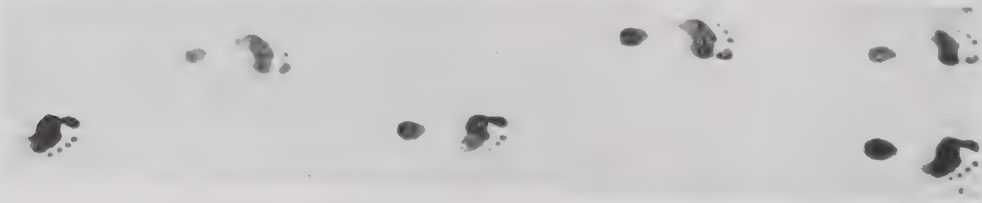
TABLE 427

Robert

SKELETAL MATURATION  
*Values in months*

Chrono- logical age	HAND				ELBOW	AVERAGE
	B.B.G.*	Flory†	Kelly‡	Todd§	Todd§	Todd§
60	64	43	<72	57	63	60
70	84	65	78	72	72	72

\* Baldwin, B. T., Busby, L. M., Garside, H. V. Anatomic growth of children. University of Iowa Studies in Child Welfare, vol. 4, no. 1, 1928.  
† Flory, C. D. Osseous development in the hand as an index of skeletal development. Monographs of the Society for Research in Child Development, vol. 1, no. 3, 1936.  
‡ Kelly, H. J. Anatomic age and its relation to stature. University of Iowa Studies in Child Welfare, vol. 12, no. 5, 1937. No standards less than 72 months.  
§ Determined by T. Wingate Todd and C. C. Francis, Western Reserve University, Cleveland.



ROBERT  
FIGURE 726. Postural footprints, age 71 months.

TABLE 428

Robert  
68 months

## NITROGEN PARTITION OF URINE

*Values in grams of nitrogen per day*

Date	Total nitrogen	Urea	Ammonia	Creatinine +Creatine	Creatinine	Uric acid
4-13	6.35	5.15	0.155	0.226	0.171	0.092
4-14	6.65	5.40	0.150	0.232	0.137	0.114
4-15	7.61	6.17	0.157	0.270	0.153	0.142
4-16	6.40	4.70	0.173	0.217	0.142	0.119
4-17	5.95	4.66	0.133	0.209	0.109	0.093
4-18	5.38	4.68	0.175	0.170	0.119	0.087
4-19	6.76	5.64	0.118	0.260	0.146	0.123
4-20	7.03	5.98	0.124	0.286	0.150	0.126
4-21	6.78	5.48	0.168	0.334	0.171	0.120
4-22	5.64	4.74	0.141	0.267	0.151	0.102
4-23	6.85	5.56	0.155	0.283	0.173	0.088
4-24	6.27	4.83	0.150	0.385	0.135	0.090
4-25	8.01	6.73	0.150	0.302	0.181	0.123
4-26	6.66	5.86	0.150	0.298	0.153	0.127
4-27	6.44	5.79	0.162	0.343	0.178	0.108
4-28	7.07	6.17	0.165	0.321	0.185	0.159
4-29	6.36	4.83	0.170	0.322	0.183	0.115
4-30	6.92	6.02	0.180	0.259	0.152	0.119
5-1	7.04	6.25	0.230	0.357	0.157	0.137
5-2	6.64	5.68	0.187	0.260	0.130	0.122
5-3	6.16	5.37	0.169	0.187	0.137	0.127
5-5	6.04	5.07	0.204	0.462	0.165	0.146
5-6	6.66	5.18	0.758	0.397	0.140	0.192
5-7	6.82	5.78	0.177	0.351	0.093	0.125
5-8	6.34	5.68	0.237	0.432	0.176	0.129
5-9	6.52	5.60	0.209	0.507	0.170	0.125
5-10	6.55	5.85	0.173	0.440	0.151	0.119
5-11	5.33	4.72	0.153	0.442	0.159	0.087
5-12	7.37	6.32	0.163	0.485	0.187	0.139
5-13	5.93	5.31	0.137	0.472	0.172	0.119
5-14	5.89	4.99	0.176	0.600	0.231	0.118
5-15	6.78	5.91	0.200	0.514	0.151	0.138
5-16	6.60	5.76	0.200	0.422	0.176	0.129
5-17	7.61	6.59	0.169	0.528	0.177	0.167
5-18	7.90	6.77	0.188	0.414	0.155	0.152
5-19	8.83	8.10	0.189	0.446	0.163	0.171
5-20	8.56	7.30	0.181	0.504	0.182	0.173
5-21	7.54	6.38	0.188	0.491	0.186	0.124
5-22	9.02	7.51	0.221	0.463	0.158	0.169
5-23	7.73	6.92	0.209	0.506	0.157	0.160
5-24	8.46	7.37	0.198	0.500	0.165	0.113
5-25	9.36	8.01	0.196	0.470	0.184	0.149
5-26	8.73	6.60	0.154	0.462	0.167	0.126
5-27	7.53	6.25	0.192	0.289	0.131	0.113
5-28	8.22	7.00	0.224	0.373	0.161	0.124
5-29	9.29	8.47	0.200	0.526	0.173	0.152
5-30	9.56	8.47	0.182	0.556	0.205	0.137
5-31	9.04	7.86	0.264	0.591	0.189	0.122
6-1	9.62	8.52	0.236	0.511	0.197	—

The age given is the initial age at start of study.



FIGURE 727. ROBERT  
Age 68 months



ROBERT

FIGURE 728. Actual size reproduction of roentgenogram of jaws.  
Chronological age 60 months.



ROBERT

FIGURE 729. Actual size reproduction of roentgenogram of jaws.  
Chronological age 70 months.



ROBERT

FIGURE 730. Actual size reproduction of roentgenogram of left hand.  
Chronological age 60 months.





ROBERT

FIGURE 731. Actual size reproduction of roentgenogram of left hand.  
Chronological age 70 months.

## SHIRLEY

When Shirley joined the study group she was 98 months old. Physical examination and prior medical history were essentially negative. Psychological examination at 88 months had shown a M.A. of 96 months, I.Q. 109.

TABLE 429

Shirley

### BLOOD DETERMINATIONS

Age	Date	Red cells	Hemo-globin	WHITE BLOOD CELLS				
				Total	Poly-morpho-nuclears	Lym-pho-cytes	Mono-cytes	Eosino-philés
months	mo.-day	millions	gm./100 cc.	per c. mm.	per cent	per cent	per cent	per cent
99	6-28	3.96	13*	5400	53	41	4	2

\* Newcomer method.

TABLE 430

Shirley

### RECUMBENT LENGTH AND WEIGHT

Age	Recumbent length	Weight	Age	Recumbent length	Weight
mo.-days	cm.	kg.	mo.-days	cm.	kg.
98-3	—	24.03	98-21	—	24.07
98-5	125.0	—	98-26	—	24.26
98-6	—	24.21			
98-12	—	24.28	99-8	126.8	—
98-16	—	23.93	99-9	—	24.04

Actual values are averages of independent measurements by two workers. In calculating the smooth values given with the balance data the actual values given above were smoothed by three-point averaging and the resulting figures entered for their respective balance periods. Values for balance periods intervening between measurements were obtained by interpolation.

TABLE 431

Shirley

### HEIGHT AND WEIGHT RECORD

Age	Height	Weight	Age	Height	Weight
months	inches	pounds	months	inches	pounds
88	46	47 $\frac{3}{4}$	93	48 $\frac{1}{4}$	50
88	46 $\frac{1}{2}$	45 $\frac{3}{4}$	107	51 $\frac{1}{2}$	53 $\frac{1}{2}$
89	—	47 $\frac{1}{2}$	143	56 $\frac{1}{2}$	70 $\frac{1}{4}$

TABLE 432

Shirley  
98 monthsFOOD INTAKE  
*Values in grams per day*

Food	DATE	Food	DATE	Food	DATE
	5-28 to 6-22		5-28 to 6-22		5-28 to 6-22
Apple	100	Cabbage	25	Whole orange	100
Banana	100	Carrot	25	Potato	70
Beef, lean	60	Celery	20	Salt	2
Bread, white	60	Cheese, American	15	Shredded wheat	30
Bread, whole wheat	30	Egg, whole	50	Sugar (average)	167
Butter	30	Lettuce	20	Canned tomato	60
		Milk, fluid	400	Water (average)	993

TABLE 433

Shirley  
98 months

## BODY LENGTH AND WEIGHT—INTAKE AND ELIMINATION

Date	Recum- bent length*	Weight†	INTAKE		AVERAGE DAILY HEAT OF COMBUSTION		FECES			Laxation rate‡
			AVERAGE DAILY		Intake	Feces	AVERAGE DAILY			
			Dry wt.*	Total water†			Wet wt.	Dry wt.*	Fat	
mo.-day	cm.	kg.	gm.	gm.	Cal.	Cal.	gm.	gm.	gm.	
5-28	125	24.20	500	2280	2370	90	98.4	16.6	2.2	1.2
6-2	126	24.22	495	2076	2298	74	73.2	14.2	1.7	1.0
6-7	126	24.24	417	1556	2011	72	60.0	13.6	1.5	1.0
6-12	126	24.27	417	1718	2054	76	72.6	14.6	2.0	1.0
6-17	126	24.30	468	1874	2254	85	78.0	16.6	1.9	1.8

The age given is the initial age at start of study. Dates given are first days of five-day balance periods.

\* See Table 430 for actual values and method of smoothing.

† Based on alcohol-dried food and oven-dried feces.

‡ Drinking water plus water in foods.

§ Average number of defecations per day.

TABLE 434

Shirley  
98 monthsNITROGEN AND NEGATIVE MINERALS IN INTAKE, URINE, FECES  
*Values are averages per day*

Date	NITROGEN			PHOSPHORUS			CHLORINE			SULFUR		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
5-28	8.43	5.79	1.14	1348	340	324	3515	3182	46	724	370	85
6-2	8.43	6.05	1.02	1348	566	285	3515	2796	14	724	389	70
6-7	8.43	5.93	0.89	1348	544	264	3515	2688	22	724	374	66
6-12	8.43	5.71	1.06	1348	665	279	3515	2658	6	724	380	73
6-17	8.43	5.33	0.96	1348	464	342	3515	2424	10	724	346	76

TABLE 435

Shirley  
98 months

POSITIVE MINERALS IN INTAKE, URINE, FECES  
*Values are averages per day*

Date	CALCIUM			MAGNESIUM			SODIUM			POTASSIUM		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
5-28	991	83	472	310	84	141	2312	1456	71	2324	1864	376
6-2	991	80	423	310	84	136	2312	1465	21	2324	414	310
6-7	991	74	379	310	82	123	2312	1395	209	2324	2102	292
6-12	991	79	412	310	87	136	2312	1367	18	2324	1741	369
6-17	991	80	503	310	74	155	2312	1222	35	2324	1689	401

TABLE 436

Shirley  
98 months

NITROGEN PARTITION OF URINE  
*Values in grams of nitrogen per day*

Date	Total nitrogen	Urea	Ammonia	Creatinine + Creatine	Creatinine	Uric acid
5-25	6.70	4.65	0.191	0.497	0.176	0.159
5-27	7.18	5.84	0.279	0.425	0.191	0.113
5-30	5.25	4.74	0.282	0.429	0.151	0.090
5-31	3.65	3.39	0.160	0.296	0.109	—
6-1	8.04	7.15	0.233	0.582	0.283	—

The age given is the initial age at start of study.

TABLE 437

Shirley

SKELETAL MATURATION  
*Values in months*

Chrono-logical age	HAND			ELBOW	AVERAGE
	B.B.G.*	Flory†	Todd‡	Todd‡	Todd‡
88	83	68	80	75	78
99	99	78	93	88	90

\* Baldwin, B. T., Busby, L. M., Garside, H. V. *Anatomic growth of children*. University of Iowa Studies in Child Welfare, vol. 4, no. 1, 1928.  
† Flory, C. D. *Osseous development in the hand as an index of skeletal development*. Monographs of the Society for Research in Child Development, vol. 1, no. 3, 1936.  
‡ Determined by T. Wingate Todd and C. C. Francis, Western Reserve University, Cleveland.

TABLE 438

Shirley

MEASUREMENTS OF THE BONES OF THE WRIST

AGE, months	88	99	AGE, months	88	99
CARPALS			CARPALS		
AREA, sq. mm.			GREATEST DIAMETER, mm.		
Hamate	78	100	Hamate	12	14
Capitate	132	160	Capitate	16	18
Lesser Multangular	30	46	Lesser Multangular	7	8
Greater Multangular	49	65	Greater Multangular	9	10
Navicular	44	65	Navicular	9	11
Lunate	47	62	Lunate	9	11
Triangular	45	63	Triangular	9	11
			Epiphyses		
ULNA			1st Metacarpal	7	9
DIAMETER, mm.			2nd Metacarpal	8	10
Distal epiphysis	2	6	3rd Metacarpal	8	10
Distal metaphysis	12	14	4th Metacarpal	6	8
RADIUS			WRIST AREA,* sq. mm.	940	1086
DIAMETER, mm.					
Distal epiphysis	16	19			

\* Measured with the planimeter using Flory's landmarks (Monographs of the Society for Research in Child Development, Vol. I, No. 3, 1936).

TABLE 439

Shirley  
98 months

ORAL EXAMINATION

The oral hygiene is only fair and caries is rampant. The gum tissue is healthy and there are no hypoplastic or malacotic teeth. Fraenum is practically absent, only a high, thin remnant. Bite is open, due to loss of deciduous teeth and erupting permanents. There are yellow and black stains on the teeth. Occlusion is normal. There are a few closed cavities, and quite a number of open cavities. General oral condition, as far as caries is concerned, is very poor. Hygiene is only fair.

(Except for improvement in general oral condition no changes were noted upon re-examination one and one-half months later.)



SHIRLEY

FIGURE 732. Postural footprints, age 99 months.





FIGURE 733. SHIRLEY  
Age 98 months





SHIRLEY

FIGURE 734. Actual size reproduction of roentgenogram of jaws.  
Chronological age 88 months.



SHIRLEY

FIGURE 735. Actual size reproduction of roentgenogram of jaws.  
Chronological age 99 months.



SHIRLEY

FIGURE 736. Actual size reproduction of roentgenogram of left hand.  
Chronological age 88 months.



SHIRLEY

FIGURE 737. Actual size reproduction of roentgenogram of left hand.  
Chronological age 99 months.



PAUL

When Paul joined the study group he was 79 months old. Physical examination and prior medical history were essentially negative.

TABLE 440

Paul

BLOOD DETERMINATIONS

Age	Date	Red cells	Hemo- globin*	WHITE BLOOD CELLS				
				Total	Poly- morpho- nuclears	Lym- pho- cytes	Mono- cytes	Eosino- philes
months	mo.-day	millions	gm./100 cc.	per c. mm.	per cent	per cent	per cent	per cent
81	6-28	4.22	14	8200	58	38	3	1
MINERALS (mg. per 100 ml.)								
79	4-21	Serum calcium			Plasma phosphorus			
		11.9			4.5			

\* Newcomer method.

TABLE 441

Paul  
79 months

FOOD INTAKE

Values in grams per day

Food	DATE		Food	DATE	
	4-18	5-18		4-18	5-18
	to 5-18	to 6-27		to 5-18	to 6-27
Apple	100	100	Egg, whole	50	50
Banana	100	100	Lettuce	20	20
Beef, lean	60	60	Milk, fluid	400	1000
Bread, white	60	60	Whole orange	100	100
Bread, whole wheat	30	30	Potato	70	70
Butter	30	30	Salt	2	2
Cabbage	25	25	Shredded wheat	30	30
Carrot	25	25	Canned tomato	60	60
Celery	20	20	Sugar (average)	152	83
Cheese, American	15	15	Water (average)	751	524



PAUL

FIGURE 738. Postural footprints, age 81 months.



TABLE 442  
RECUMBENT LENGTH AND  
WEIGHT

Paul

Age	Recumbent length	Weight
mo.-days	cm.	kg.
78-25	114.8	22.68
79-0	—	22.42
79-11	—	22.49
79-15	—	22.65
79-20	—	22.64
79-25	—	22.64
80-0	—	22.75
80-4	117.6	—
80-5	—	23.00
80-11	—	23.04
80-15	—	22.98
80-20	—	22.98
80-25	—	22.95
81-0	—	22.83
81-7	118.4	—
81-8	—	23.12

Actual values are averages of independent measurements by two workers.

TABLE 444  
HEIGHT AND WEIGHT RECORD

Paul

Age	Height	Weight
months	inches	pounds
71	—	46 $\frac{1}{4}$
72	—	45 $\frac{1}{2}$
75	—	48
82	46 $\frac{3}{4}$	52 $\frac{1}{4}$
85	47	53 $\frac{1}{2}$
89	48 $\frac{1}{4}$	56 $\frac{1}{2}$

TABLE 443  
MEASUREMENTS OF THE BONES  
OF THE WRIST

Paul

AGE, months	80
CARPALS	
AREA, sq. mm.	
Hamate	70
Capitate	128
Lesser Multangular	31
Greater Multangular	17
Navicular	25
Lunate	32
Triangular	40
GREATEST DIAMETER, mm.	
Hamate	11
Capitate	16
Lesser Multangular	7
Greater Multangular	6
Navicular	6
Lunate	8
Triangular	8
Epiphyses	
1st Metacarpal	8
2nd Metacarpal	10
3rd Metacarpal	10
4th Metacarpal	8
ULNA	
DIAMETER, mm.	
Distal epiphysis	7
Distal metaphysis	15
RADIUS	
DIAMETER, mm.	
Distal epiphysis	19
WRIST AREA,* sq. mm.	1032

\* Measured with the planimeter using Flory's landmarks (Monographs of the Society for Research in Child Development, Vol. I, No. 3, 1936).

TABLE 445

Paul

SKELETAL MATURATION  
*Values in months*

Chrono- logical age	HAND				ELBOW	AVERAGE
	B.B.G.*	Flory†	Kelly‡	Todd§	Todd§	Todd§
80	85	67	90	79	80	80

\* Baldwin, B. T., Busby, L. M., Garside, H. V. Anatomic growth of children. University of Iowa Studies in Child Welfare, vol. 4, no. 1, 1928.

† Flory, C. D. Osseous development in the hand as an index of skeletal development. Monographs of the Society for Research in Child Development, vol. 1, no. 3, 1936.

‡ Kelly, H. J. Anatomic age and its relation to stature. University of Iowa Studies in Child Welfare, vol. 12, no. 5, 1937.

§ Determined by T. Wingate Todd and C. C. Francis, Western Reserve University, Cleveland;

TABLE 446

Paul  
67 months

## ORAL EXAMINATION

General oral condition and hygiene is very poor. The gums are healthy. Both upper first permanent molars are malacotic. Bite is a deep overlap, occlusion is normal. There are no stains on the teeth, outside of soft yellow calculus. Attrition is medium on all deciduous canines and upper anteriors. Upper and lower posteriors and lower anteriors show a slight attrition. There are developmental pits in all first permanent molars and many open cavities in the deciduous teeth. Lower right deciduous first molar has been extracted. The fact that the lower central incisors are erupting and the first permanent molars are fully erupted would lead to a suspicion of the given birth date. The general oral picture is one of poor oral hygiene and abundant caries.

(Upon re-examination one and one-half months later the lower permanent central incisors were fully erupted and the upper central incisors one-third erupted. General oral condition was somewhat improved.)

TABLE 447

Paul  
79 months

## BODY LENGTH AND WEIGHT—INTAKE AND ELIMINATION

Date	Recum- bent length*	Weight*	INTAKE		AVERAGE DAILY HEAT OF COMBUSTION		FECES			Laxation rate‡
			AVERAGE DAILY		Intake	Feces	AVERAGE DAILY			
			Dry wt.*	Total water†			Wet wt.	Dry wt.*	Fat	
mo.-day	cm.	kg.	gm.	gm.	Cal.	Cal.	gm.	gm.	gm.	
4-18	115	22.30	477	1578	2214	100	112.4	20.2	2.8	1.2
4-23	115	22.37	489	1560	2246	98	148.4	24.6	2.4	1.8
4-28	115	22.43	457	1717	2177	115	150.2	23.0	2.7	2.0
5-3	116	22.50	442	1623	2043	114	153.2	23.2	3.0	1.8
5-8	116	22.58	444	1619	2118	127	168.0	25.6	2.7	2.2
5-13	116	22.65	421	1783	2024	104	143.0	22.2	2.5	1.8
5-18	116	22.72	459	1802	2245	121	158.8	24.8	2.5	2.2
5-23	117	22.80	499	1918	2423	121	145.0	24.6	2.6	1.8
5-28	117	22.87	465	1957	2334	125	164.8	24.0	3.6	2.0
6-2	117	22.95	447	1983	2215	130	144.2	25.6	2.9	2.0
6-7	118	23.00	435	1965	2190	144	204.0	30.4	3.1	2.0
6-12§	118	23.00	434	1960	2228	115	145.6	23.8	2.2	1.8
6-17§	118	23.00	428	1972	2203	126	156.6	24.5	2.5	1.5
6-22	119	23.00	476	2050	2364	108	123.6	22.2	2.2	1.6

The age given is the initial age at start of study. Dates given are first days of five-day balance periods.

\* See Table 442 for actual values and method of smoothing.

† Based on alcohol-dried food and oven-dried feces.

‡ Drinking water plus water in foods.

§ Average number of defecations per day.

§ The interval from 6-12 to 6-22 actually consisted of one seven-day and one three-day period. To achieve consistency among the balance periods the daily averages for the 10-day interval have been reaveraged on the basis two five-day periods.

TABLE 448

Paul  
79 monthsNITROGEN AND NEGATIVE MINERALS IN INTAKE, URINE, FECES  
*Values are averages per day*

Date	NITROGEN			PHOSPHORUS			CHLORINE			SULFUR		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
4-18	8.43	7.83	0.94	1348	632	437	3515	3218	44	724	485	107
4-23	8.43	6.79	0.87	1348	506	426	3515	3457	65	724	424	120
4-28	8.43	6.84	1.02	1348	653	417	3515	2536	57	724	458	113
5-3	8.43	6.56	1.04	1348	556	441	3515	2802	75	724	429	112
5-8	8.43	7.02	1.14	1348	495	478	3515	3151	102	724	443	124
5-13	8.43	6.96	1.06	1348	521	434	3515	2652	69	724	420	106
5-18	11.22	9.55	1.13	2089	788	711	4181	3165	66	907	552	112
5-23	11.22	8.64	1.17	2089	909	732	4181	3438	67	907	553	116
5-28	11.22	9.04	1.10	2089	883	773	4181	3831	86	907	585	104
6-2	11.22	8.89	1.04	2089	913	731	4181	3600	74	907	585	108
6-7	11.22	9.58	1.65	2089	819	914	4181	3363	128	907	608	130
6-12*	11.22	8.92	1.39	2089	773	740	4181	3720	87	907	570	106
6-17*	11.22	8.34	1.29	2089	735	735	4181	3126	57	907	523	108
6-22	11.22	8.33	1.28	2089	769	679	4181	3630	14	907	575	98

\* See footnotes to Table 447.

TABLE 449

Paul  
79 monthsPOSITIVE MINERALS IN INTAKE, URINE, FECES  
*Values are averages per day*

Date	CALCIUM			MAGNESIUM			SODIUM			POTASSIUM		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
4-18	991	35	646	310	94	137	2312	1260	31	2324	1982	539
4-23	991	34	664	310	83	167	2312	1832	64	2324	1584	640
4-28	991	34	631	310	80	169	2312	1565	34	2324	1730	634
5-3	991	38	638	310	77	157	2312	1446	112	2324	1407	637
5-8	991	38	675	310	63	142	2312	1497	132	2324	1701	727
5-13	991	33	621	310	72	146	2312	1352	109	2324	1115	640
5-18	1889	63	1156	399	84	180	2665	1858	57	3488	2101	809
5-23	1889	68	1034	399	83	217	2665	1940	45	3488	2081	656
5-28	1889	78	1093	399	79	208	2665	1940	78	3488	2622	731
6-2	1889	74	1206	399	79	234	2665	1903	35	3488	2585	738
6-7	1889	76	1221	399	88	237	2665	1731	133	3488	2331	918
6-12*	1889	80	1171	399	82	205	2665	1932	53	3488	2495	719
6-17*	1889	75	1150	399	78	213	2665	1595	63	3488	2358	752
6-22	1889	105	1084	399	85	198	2665	1863	26	3488	2517	594

\* See footnotes to Table 447.

TABLE 450

Paul  
79 months

## NITROGEN PARTITION OF URINE

*Values in grams of nitrogen per day*

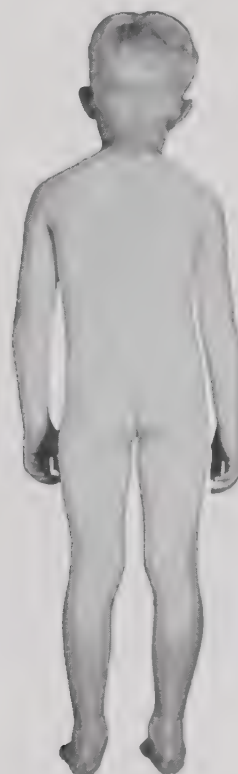
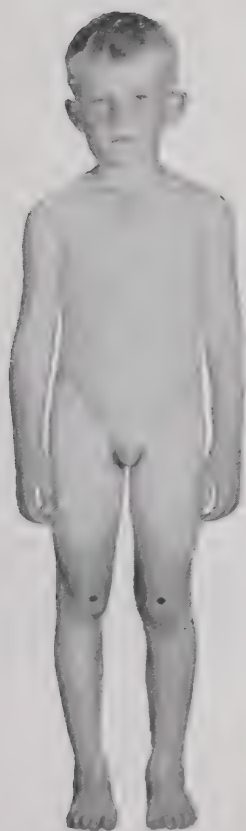
Date	Total nitrogen	Urea	Ammonia	Creatinine + Creatine	Creatinine	Uric acid
4-18	11.44	7.81	0.324	0.340	0.298	0.171
4-19	7.06	7.65	0.230	0.315	0.223	0.135
4-20	7.10	5.79	0.191	0.274	0.178	0.125
4-21	7.12	4.80	0.218	0.383	0.219	0.201
4-22	6.41	4.75	0.170	0.398	0.209	0.164
4-23	6.69	5.30	0.191	0.377	0.187	0.087
4-24	7.22	5.90	0.217	0.286	0.159	0.143
4-25	6.76	5.49	0.200	0.272	0.173	0.122
4-26	6.52	5.29	0.200	0.290	0.153	0.115
4-27	6.78	5.60	0.186	0.461	0.216	0.083
4-28	6.32	5.26	0.201	0.491	0.198	0.108
4-29	6.61	5.43	0.188	0.431	0.192	0.102
4-30	6.69	5.73	0.258	0.381	0.173	0.116
5-1	7.34	6.60	0.186	0.437	0.221	0.141
5-2	7.20	5.65	0.202	0.400	0.184	0.116
5-3	6.87	5.88	0.220	0.404	0.158	0.132
5-4	6.55	5.58	0.218	0.501	0.184	0.060
5-5	6.25	5.39	0.241	0.421	0.180	0.145
5-6	6.34	5.47	0.200	0.397	0.159	0.201
5-7	6.79	5.92	0.190	0.580	0.208	0.135
5-8	7.11	6.23	0.215	0.426	0.169	0.112
5-9	6.49	5.52	0.308	0.513	0.179	—
5-10	6.75	5.68	0.232	0.504	0.180	—
5-11	6.99	5.91	0.205	0.492	0.204	0.144
5-12	7.76	6.58	0.275	0.512	0.185	0.161
5-13	5.86	5.03	0.175	0.411	0.183	0.125
5-14	5.98	4.91	0.209	0.495	0.234	0.116
5-15	7.22	6.42	0.126	0.295	0.104	0.114
5-16	9.25	7.78	0.350	0.578	0.330	0.069
5-17	6.51	6.15	0.243	0.430	0.193	0.122
5-18	7.84	6.15	0.243	0.171	0.088	—
5-19	13.30	11.24	0.207	0.632	0.274	—
5-20	8.66	7.29	0.268	0.461	0.169	—
5-21	8.50	7.14	0.321	0.460	0.238	—
5-22	9.48	7.87	0.314	0.433	0.166	—
5-23	8.53	7.42	0.281	0.470	0.194	0.179
5-24	8.61	7.61	0.232	0.460	0.178	0.120
5-25	8.73	7.20	0.252	0.452	0.192	—
5-26	7.86	6.46	0.248	0.374	0.180	—
5-27	9.46	7.42	0.312	0.756	0.228	—
5-28	8.37	7.28	0.248	0.372	0.188	—
5-29	8.77	7.69	0.241	0.525	0.224	—
5-30	9.04	7.69	0.261	0.508	0.196	—
5-31	9.32	8.08	0.294	0.492	0.178	—
6-1	9.73	8.43	0.300	0.528	0.208	—

The age given is the initial age at start of study.





FIGURE 739. PAUL  
Age 80 months







PAUL

FIGURE 740. Actual size reproduction of roentgenogram of jaws.  
Chronological age 80 months.




PAUL

FIGURE 741. Actual size reproduction of roentgenogram of jaws.  
Chronological age 90 months.



PAUL

FIGURE 742. Actual size reproduction of roentgenogram of left hand.  
Chronological age 80 months. 

## CALVIN

When Calvin joined the study group he was 123 months old. Physical examination and prior medical history were essentially negative.

TABLE 451

Calvin

### BLOOD DETERMINATIONS

Age	Date	Red cells	Hemo-globin*	WHITE BLOOD CELLS				
				Total	Poly-morpho-nuclears	Lym-pho-cytes	Mono-cytes	Eosino-philes
months	mo.-day	millions	gm./100 cc.	per c. mm.	per cent	per cent	per cent	per cent
125	6-28	4.01	13	7000	55	41	4	0
MINERALS (mg. per 100 ml.)								
Serum calcium				Serum phosphorus				
123	5-19	9.4			4.6			

\* Newcomer method.

TABLE 452

Calvin  
123 months

### FOOD INTAKE

*Values in grams per day*

Food	DATE			Food	DATE		
	5-8 to 5-18	5-18 to 6-7	6-7 to 6-27		5-8 to 5-18	5-18 to 6-7	6-7 to 6-27
Apple	100	150	150	Egg, whole	50	75	75
Banana	100	150	150	Lettuce	20	30	30
Beef, lean	60	90	90	Milk, fluid	400	600	1000
Bread, white	60	90	90	Whole orange	100	150	150
Bread, whole wheat	30	45	45	Potato	70	105	105
Butter	30	45	45	Salt	2	3	3
Cabbage	25	38	38	Shredded wheat	30	45	45
Carrot	25	37	37	Sugar (average)	186	103	46
Celery	20	30	30	Canned tomato	60	90	90
Cheese, American	15	22	22	Water (average)	1010	1202	856

TABLE 453 Calvin  
RECUMBENT LENGTH AND  
WEIGHT

Age	Recumbent length	Weight
mo.-days	cm.	kg.
122-27	—	33.57
123-2	—	34.03
123-7	—	33.91
123-12	—	34.24
123-16	134.2	—
123-17	—	34.32
123-23	—	34.32
123-27	—	34.70
124-2	—	34.59
124-7	—	34.47
124-12	—	34.76
124-19	134.8	—
124-20	—	34.66

Actual values are averages of independent measurements by two workers. In calculating the smooth values given with the balance data the actual values given above were smoothed by three-point averaging and the resulting figures entered for their respective balance periods. Values for balance periods intervening between measurements were obtained by interpolation.

TABLE 455 Calvin  
HEIGHT AND WEIGHT RECORD

Age	Height	Weight
months	inches	pounds
119	47	70
127	53 $\frac{1}{2}$	74 $\frac{1}{2}$
132	54 $\frac{1}{4}$	76 $\frac{3}{4}$

TABLE 454 Calvin  
MEASUREMENTS OF THE BONES  
OF THE WRIST

AGE, months	123
CARPALS	
AREA, sq. mm.	
Hamate	166
Capitate	235
Lesser Multangular	102
Greater Multangular	110
Navicular	147
Lunate	115
Triangular	100
GREATEST DIAMETER, mm	
Hamate	18
Capitate	22
Lesser Multangular	12
Greater Multangular	14
Navicular	18
Lunate	15
Triangular	16
Epiphyses	
1st Metacarpal	12
2nd Metacarpal	13
3rd Metacarpal	14
4th Metacarpal	13
ULNA	
DIAMETER, mm.	
Distal epiphysis	16
Distal metaphysis	17
RADIUS	
DIAMETER, mm.	
Distal epiphysis	28
WRIST AREA,* sq. mm.	1606

\* Measured with the planimeter using Flory's landmarks (Monographs of the Society for Research in Child Development, Vol. I, No. 3, 1936).

TABLE 456

Calvin  
124 months

### ORAL EXAMINATION

General condition of mouth is poor. The maxillary gingivae are somewhat hypertrophic and the interdental papillae bulging. In the mandibular incisor region, the cingula of the gingivae have receded from the necks of lower lateral and central incisors. The upper left first bicuspid has a number of chalky malacotic spots. There is some spacing between the upper central permanent incisors. Teeth are stained at the necks, orange and black. Bite is a lower protrusion, perhaps accounting for the lower gum recession. Occlusion in the molar regions is normal. Attrition is not particularly marked on any of the teeth. There are a number of developmental pits, particularly in the lower molars, and a few closed cavities. Taken as a whole, the dentition is rather poor, as is the oral hygiene.

(No change other than slight improvement in general oral condition was noted upon re-examination one and one-half months later.)



TABLE 457

Calvin  
123 months

## BODY LENGTH AND WEIGHT - INTAKE AND ELIMINATION

Date	Recum- bent length*	Weight*	INTAKE		AVERAGE DAILY HEAT OF COMBUSTION		FECES			Laxation rate‡
			AVERAGE DAILY		Intake	Feces	AVERAGE DAILY			
			Dry wt.*	Total water†			Wet wt.	Dry wt.*	Fat	
mo.-day	cm.	kg.	gm.	gm.	Cal.	Cal.	gm.	gm.	gm.	
5-8	134	33.67	499	1768	2340	90	127.8	18.6	1.7	1.6
5-13	134	33.80	466	2056	2205	70	92.2	15.0	1.8	1.2
5-18	134	33.95	533	2337	2585	142	144.2	24.6	3.0	1.2
5-23	134	34.10	565	2551	2740	132	181.8	26.6	2.8	1.8
5-28	134	34.23	561	2671	2797	143	251.2	28.2	4.0	2.8
6-2	134	34.37	555	2638	2699	118	185.0	26.2	2.8	2.0
6-7	134	34.50	540	2632	2748	168	204.8	32.8	4.9	1.8
6-12§	135	34.65	520	2523	2729	131	194.7	27.4	3.6	1.8
6-17§	135	34.80	518	2519	2716	141	209.5	28.8	3.7	2.1
6-22	135	34.95	553	2595	2814	144	202.4	28.6	3.9	1.8

The age given is the initial age at start of study. Dates given are first days of five-day balance periods.

\* See Table 453 for actual values and method of smoothing.

‡ Based on alcohol-dried food and oven-dried feces.

† Drinking water plus water in foods.

‡ Average number of defecations per day.

§ The interval from 6-12 to 6-22 actually consisted of one seven-day and one three-day period. To achieve consistency among the balance periods the daily averages for the 10-day interval have been re-arranged on the basis of two five-day periods.

TABLE 458

Calvin  
123 monthsNITROGEN AND NEGATIVE MINERALS IN INTAKE, URINE, FECES  
*Values are averages per day*

Date	NITROGEN			PHOSPHORUS			CHLORINE			SULFUR		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
5-8	8.43	7.49	0.97	1348	586	381	3515	2769	37	724	455	97
5-13	8.43	9.74	0.85	1348	474	324	3515	2290	29	724	413	78
5-18	12.65	9.50	1.24	2022	775	483	4545	3842	71	1086	633	198
5-23	12.65	9.80	1.37	2022	900	530	4545	3754	62	1086	655	134
5-28	12.65	10.28	1.58	2022	874	476	4545	4347	113	1086	667	132
6-2	12.65	9.46	1.39	2022	887	522	4545	3358	72	1086	620	126
6-7	14.51	11.86	1.37	2763	997	748	5211	4150	93	1269	778	158
6-12	14.51	10.62	1.54	2763	932	647	5211	3929	78	1269	704	133
6-17	14.51	10.33	1.54	2763	1079	671	5211	3564	89	1269	669	131
6-22	14.51	10.82	1.45	2763	1026	623	5211	4152	74	1269	722	127



TABLE 459

Calvin  
123 months

## POSITIVE MINERALS IN INTAKE, URINE, FECES

*Values are averages per day*

Date	CALCIUM			MAGNESIUM			SODIUM			POTASSIUM		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
5-8	991	102	478	310	82	113	2312	1271	89	2324	2146	530
5-13	991	80	401	310	92	107	2312	1115	68	2324	1794	448
5-18	1486	141	869	465	131	220	2996	2417	52	3487	2004	744
5-23	1486	139	800	465	148	208	2996	2177	83	3487	3615	932
5-28	1486	149	815	465	138	201	2996	2124	84	3487	2584	996
6-2	1486	143	859	465	101	206	2996	1676	59	3487	1738	842
6-7	2384	182	1347	554	149	264	3349	2104	69	4650	3178	1024
6-12*	2384	148	1154	554	132	228	3349	1956	46	4650	3069	936
6-17*	2384	158	1218	554	138	229	3349	1778	59	4650	3118	983
6-22	2384	172	1150	554	146	218	3349	2119	52	4650	3105	986

\* See footnotes to Table 457.

TABLE 460

Calvin  
123 months

## NITROGEN PARTITION OF URINE

*Values in grams of nitrogen per day*

Date	Total nitrogen	Urea	Ammonia	Creatinine + Creatine	Creatinine	Uric acid
5-17	7.32	3.94	0.151	0.427	0.194	0.118
5-18	9.95	8.12	0.381	0.904	0.582	0.227
5-19	10.04	8.64	0.272	0.748	0.367	0.236
5-20	8.90	7.47	0.241	0.600	0.363	0.126
5-21	9.11	7.40	0.299	0.988	0.460	0.191
5-22	9.52	8.10	0.417	0.789	0.343	0.218

The age given is the initial age at start of study.

TABLE 461

Calvin

## SKELETAL MATURATION

*Values in months*

Chrono-logical age	HAND				ELBOW	AVERAGE
	B.B.G.*	Flory†	Kelly‡	Todd§	Todd§	Todd§
123	133	109	138	152	154	153

\* Baldwin, B. T., Busby, L. M., Garside, H. V. Anatomic growth of children. University of Iowa Studies in Child Welfare, vol. 4, no. 1, 1928.

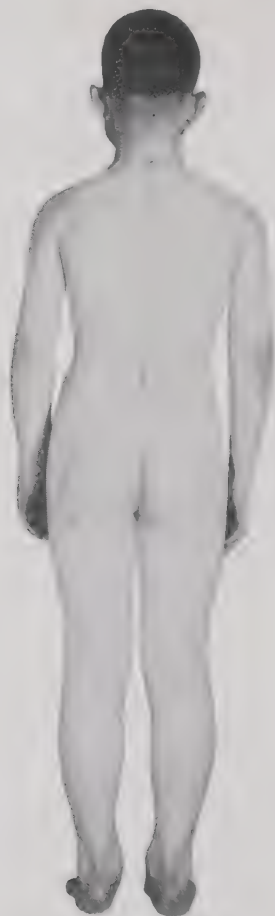
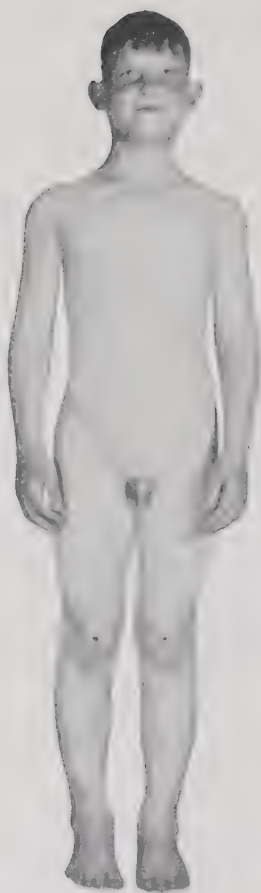
† Flory, C. D. Osseous development in the hand as an index of skeletal development. Monographs of the Society for Research in Child Development, vol. 1, no. 3, 1936.

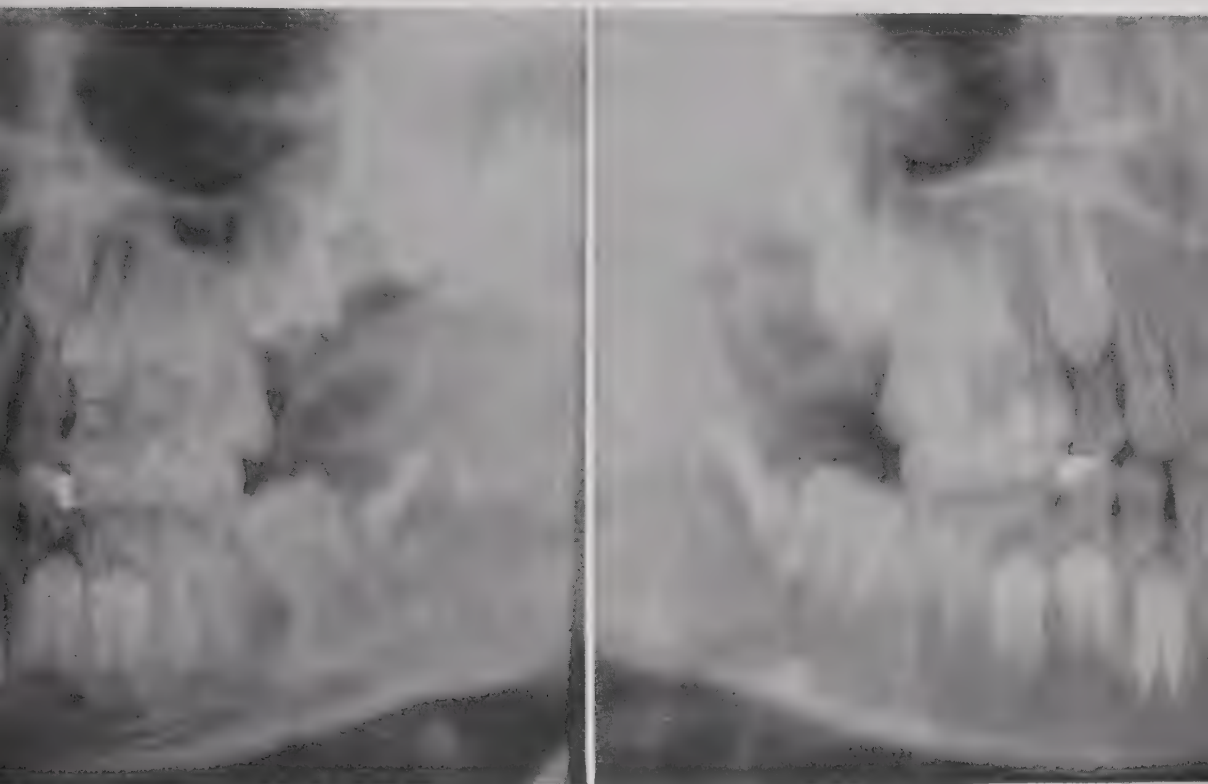
‡ Kelly, H. J. Anatomic age and its relation to stature. University of Iowa Studies in Child Welfare, vol. 12, no. 5, 1937.

§ Determined by T. Wingate Todd and C. C. Francis, Western Reserve University, Cleveland.



FIGURE 743. CALVIN  
Age 123 months





CALVIN

FIGURE 744. Actual size reproduction of roentgenogram of jaws.  
Chronological age 123 months.



CALVIN

FIGURE 745. Postural footprints, age 125 months.



CALVIN

FIGURE 746. Actual size reproduction of roentgenogram of left hand.  
Chronological age 123 months.

# NORMAN

TABLE 462

Norman  
57 months

## FOOD INTAKE

Values in grams per day

Food	DATE	Food	DATE	Food	DATE
	3-24 to 3-30		3-24 to 3-30		3-24 to 3-30
Apple	100	Cabbage	25	Whole orange	100
Banana	100	Carrot	25	Potato	70
Beef, lean	60	Celery	20	Salt	2
Bread, white	60	Cheese, American	15	Shredded wheat	30
Bread, whole wheat	30	Egg, whole	50	Sugar (average)	49
Butter	30	Lettuce	20	Canned tomato	60
		Milk, fluid	400	Water (average)	549

TABLE 463

Norman  
57 months

## BODY LENGTH AND WEIGHT—INTAKE AND ELIMINATION

Date	Recum- bent length	Weight	INTAKE		HEAT OF COMBUSTION	FECES		
			AVERAGE DAILY			AVERAGE DAILY		Laxation rate‡
			Dry weight*	Total water†	Daily intake	Wet weight	Dry weight*	
mo.-day	cm.	kg.	gm.	gm.	Cal.	gm.	gm.	
3-24	99	17.99	372	1572	1740	81.4	12.6	1.3
3-27	99	18.05	354	1297	1709	88.4	11.2	1.0

The age given is the initial age at start of study. Dates given are first days of three-day balance periods.  
 \* Based on alcohol-dried food and oven-dried feces.  
 † Drinking water plus water in foods.  
 ‡ Average number of defecations per day.

TABLE 464

Norman  
57 months

## NITROGEN AND NEGATIVE MINERALS IN INTAKE, URINE, FECES

Values are averages per day

Date	NITROGEN			PHOSPHORUS			CHLORINE			SULFUR		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
3-24	8.43	5.86	1.45	1348	436	464	3273	2649	162	724	388	119
3-27	8.43	6.45	1.10	1348	585	381	3273	2890	131	724	176	104



TABLE 465

Norman  
57 months

POSITIVE MINERALS IN INTAKE, URINE, FECES  
*Values are averages per day*

Date	CALCIUM			MAGNESIUM			SODIUM			POTASSIUM		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
3-24	991	12	764	310	90	171	2155	112	136	2324	1764	561
3-27	991	17	592	310	109	133	2155	139	157	2324	2543	550

TABLE 466 Norman  
MEASUREMENTS OF THE BONES  
OF THE WRIST

AGE, months	59
CARPALS	
AREA, sq. mm.	
Hamate	56
Capitate	80
Lesser Multangular	6
Lunate	6
Triangular	17
GREATEST DIAMETER, mm.	
Hamate	10
Capitate	13
Lesser Multangular	3
Lunate	3
Triangular	5
Epiphyses	
1st Metacarpal	6
2nd Metacarpal	7
3rd Metacarpal	8
4th Metacarpal	7
ULNA	
DIAMETER, mm.	
Distal metaphysis	12
RADIUS	
DIAMETER, mm.	
Distal epiphysis	15
WRIST AREA,* sq. mm.	894

\* Measured with the planimeter using Flory's landmarks (Monographs of the Society for Research in Child Development, Vol. I, No. 3, 1936).

TABLE 467 Norman  
RECUMBENT LENGTH AND  
WEIGHT

Age	Recumbent length	Weight
mo.-days	cm.	kg.
54-23	99.1	16.44
56-18	—	18.20
56-23	—	17.75

TABLE 468 Norman  
HEIGHT AND WEIGHT RECORD

Age	Height	Weight
months	inches	pounds
55	39	36 $\frac{1}{4}$
134	53	68 $\frac{3}{4}$
142	54 $\frac{1}{4}$	72 $\frac{1}{4}$
147	55	73 $\frac{1}{4}$
151	55 $\frac{1}{2}$	74 $\frac{1}{2}$

NITROGEN PARTITION OF THE URINE  
*Values in grams of nitrogen per day*

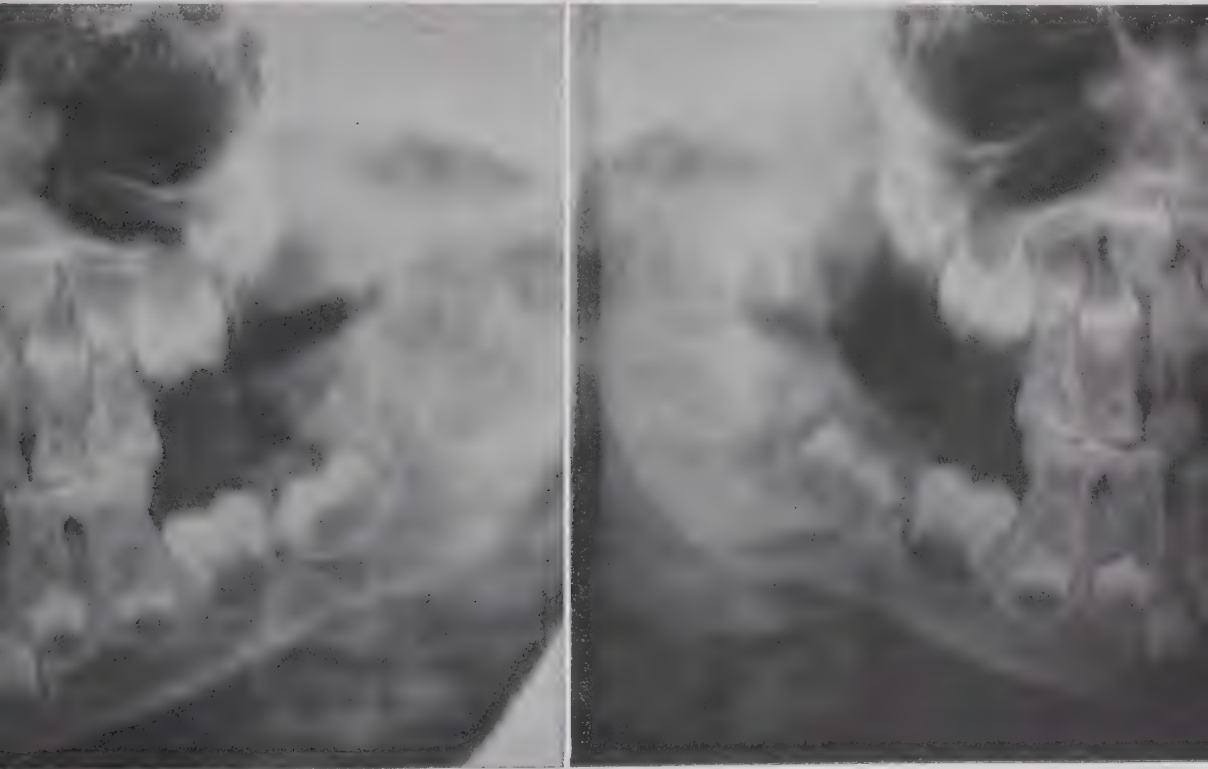
Date	Total nitrogen	Urea	Ammonia	Creatinine + Creatine	Creatinine	Uric acid
3-30	5.16	4.69	0.154	0.183	0.141	0.070
3-31	5.69	5.67	0.222	0.166	0.133	0.085
4-4	5.16	4.79	0.183	0.172	0.154	—
4-5	6.08	3.87	0.202	0.201	0.144	0.117

The age given is the initial age at start of study.

SKELETAL MATURATION  
*Values in months*

Chrono-logical age	HAND				ELBOW	AVERAGE
	B.B.G.*	Flory†	Kelly‡	Todd§	Todd§	Todd§
59	48	29	>72	51	51	51

\* Baldwin, B. T., Busby, L. M., Garside, H. V. Anatomic growth of children. University of Iowa Studies in Child Welfare, vol. 4, no. 1, 1928.  
† Flory, C. D. Osseous development in the hand as an index of skeletal development. Monographs of the Society for Research in Child Development, vol. 1, no. 3, 1936.  
‡ Kelly, H. J. Anatomic age and its relation to stature. University of Iowa Studies in Child Welfare, vol. 12, no. 5, 1937.  
§ Determined by T. Wingate Todd and C. C. Francis, Western Reserve University, Cleveland.



NORMAN  
FIGURE 747. Actual size reproduction of roentgenogram of jaws.  
Chronological age 59 months.



NORMAN

FIGURE 748. Actual size reproduction of roentgenogram of left hand.  
Chronological age 59 months.

# RONALD

TABLE 471

Ronald  
59 months

## FOOD INTAKE

Values in grams per day

Food	DATE	Food	DATE	Food	DATE
	3-24 to 3-27		3-24 to 3-27		3-24 to 3-27
Apple	100	Cabbage	25	Whole orange	100
Banana	100	Carrot	25	Potato	70
Beef, lean	60	Celery	20	Salt	2
Bread, white	60	Cheese, American	15	Shredded wheat	30
Bread, whole wheat	30	Egg, whole	50	Sugar (average)	151
Butter	30	Lettuce	20	Canned tomato	60
		Milk, fluid	400	Water (average)	282

TABLE 472

Ronald

## RECUMBENT LENGTH AND WEIGHT

Age	Recumbent length	Weight
mo.-days	cm.	kg.
56-16	111.8	19.73
58-17	—	20.21
58-22	—	20.16

TABLE 473

Ronald

## HEIGHT AND WEIGHT RECORD

Age	Height	Weight
months	inches	pounds
57	42 $\frac{1}{4}$	42 $\frac{1}{4}$
61	43 $\frac{1}{4}$	47 $\frac{1}{2}$

TABLE 474

Ronald  
59 months

## BODY LENGTH AND WEIGHT—INTAKE AND ELIMINATION

Date	Weight	INTAKE		HEAT OF COMBUSTION	FECES	
		AVERAGE DAILY			AVERAGE DAILY	
		Dry weight	Total water	Daily intake	Wet weight	Dry weight
mo.-day	kg.	gm.	gm.	Cal.	gm.	gm.
3-24	20.20	469	1163	2130	32.0	9.3

The age given is the initial age at start of study. Dates given are first days of five-day balance periods.

TABLE 475

Ronald  
59 monthsNITROGEN AND NEGATIVE MINERALS IN INTAKE, URINE, FECES  
*Values are averages per day*

Date	NITROGEN			PHOSPHORUS			CHLORINE			SULPHUR		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
3-24	8.43	6.65	0.53	1348	373	246	3273	3180	16	724	172	43

TABLE 476

Ronald  
59 monthsPOSITIVE MINERALS IN INTAKE, URINE, FECES  
*Values are averages per day*

Date	CALCIUM			MAGNESIUM			SODIUM			POTASSIUM		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
3-24	991	30	369	310	92	73	2155	978	12	2324	2351	302

TABLE 477

Ronald  
59 monthsNITROGEN PARTITION OF THE URINE  
*Values in grams of nitrogen per day*

Date	Total nitrogen	Urea	Ammonia	Creatinine + Creatine	Creatinine	Uric acid
3-24	6.70	5.59	0.241	0.388	0.172	0.205
3-25	6.36	5.05	0.190	0.365	0.192	0.186
3-26	6.90	6.12	0.185	0.188	0.146	0.203
3-28	6.70	6.02	0.210	0.200	0.145	—

The age given is the initial age at start of study.



# VIRGINIA

TABLE 478

Virginia  
78 months

## FOOD INTAKE

*Values in grams per day*

Food	DATE	Food	DATE	Food	DATE
	5-18 to 5-28		5-18 to 5-28		5-18 to 5-28
Apple	100	Cabbage	25	Whole orange	100
Banana	100	Carrot	25	Potato	70
Beef, lean	60	Celery	20	Salt	2
Bread, white	60	Cheese, American	15	Shredded wheat	30
Bread, whole wheat	30	Egg, whole	50	Sugar (average)	63
Butter	30	Lettuce	20	Canned tomato	60
		Milk, fluid	400	Water (average)	872

TABLE 479

Virginia  
78 months

## ORAL EXAMINATION

General oral condition is fair, with firm, healthy gums. There are no malacotic or hypoplastic teeth, spacing or diastemata. Bite is a medium overlap, no protrusion. Stains on the teeth are yellow. Occlusion is normal. Attrition is marked on upper canines, medium on lower canines and both upper and lower posteriors, slight on lower anteriors. Upper deciduous central incisors have been shed and lower permanent central incisors are erupting. There are quite a few open cavities and developmental pits in lower first permanent molars. In general, the oral condition is only fair.

TABLE 481

Virginia

## BLOOD DETERMINATIONS

Age	Date	MINERALS (mg. per 100 ml.)	
		Serum calcium	Plasma phosphorus
78	5-19	10.0	5.4

TABLE 480

Virginia

## RECUMBENT LENGTH AND WEIGHT

Age	Recumbent length	Weight
mo.-days	cm.	kg.
75-25	—	21.04
77-22	—	21.05
77-27	—	20.98
78-1	114.4	—
78-2	—	21.16

Actual values are averages of independent measurements by two workers. In calculating the smooth values given with the balance data the actual values given above were smoothed by three-point averaging and the resulting figures entered for their respective balance periods. Values for balance periods intervening between measurements were obtained by interpolation.

TABLE 482

Virginia

## HEIGHT AND WEIGHT RECORD

Age	Height	Weight
months	inches	pounds
74	44½	43¼

TABLE 483

Virginia  
78 months

## BODY LENGTH AND WEIGHT—INTAKE AND ELIMINATION

Date	Recum- bent length	Weight	INTAKE		HEAT OF COMBUSTION	FECES		
			AVERAGE DAILY			AVERAGE DAILY		Laxation rate
			Dry weight	Total water	Daily intake	Wet weight	Dry weight	
mo.-day	cm.	kg.	gm.	gm.	Cal.	gm.	gm.	
5-18	114	21.06	340	1762	1661	48.8	11.0	1.5
5-23	114	21.13	395	1772	1900	108.8	12.0	1.8

The age given is the initial age at start of study. Dates given are first days of five-day balance periods.

TABLE 484

Virginia  
78 months

## NITROGEN AND NEGATIVE MINERALS IN INTAKE, URINE, FECES

*Values are averages per day*

Date	NITROGEN			PHOSPHORUS			CHLORINE			SULFUR		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
5-18	8.43	6.91	0.59	1348	551	402	3515	2772	27	724	436	56
5-23	8.43	6.35	0.76	1348	555	321	3515	2633	24	724	423	54

TABLE 485

Virginia  
78 months

## POSITIVE MINERALS IN INTAKE, URINE, FECES

*Values are averages per day*

Date	CALCIUM			MAGNESIUM			SODIUM			POTASSIUM		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
5-18	991	32	651	310	94	136	2312	1766	7	2324	1831	432
5-23	991	27	539	310	87	120	2312	1564	8	2324	1881	402

TABLE 486

Virginia  
78 months

## NITROGEN PARTITION OF THE URINE

*Values in grams of nitrogen per day*

Date	Total nitrogen	Urea	Ammonia	Creatinine + Creatine	Creatinine	Uric acid
5-24	6.35	5.68	0.213	0.427	0.152	0.133
5-25	6.34	5.29	0.192	0.419	0.164	0.121
5-26	6.62	5.69	0.182	0.346	0.141	0.134
5-27	6.30	5.08	0.238	0.732	0.155	0.151
5-28	7.28	6.10	0.216	0.421	0.198	0.167
5-29	6.52	5.72	0.209	0.434	0.163	0.154
5-30	6.06	5.78	0.200	0.524	0.176	0.163

The age given is the initial age at start of study.

# WILLIAM

TABLE 487

William  
47 months

## FOOD INTAKE

Values in grams per day

Food	DATE	Food	DATE	Food	DATE
	3-24 to 3-30		3-24 to 3-30		3-24 to 3-30
Apple	100	Cabbage	25	Whole orange	100
Banana	100	Carrot	25	Potato	70
Beef, lean	60	Celery	20	Salt	2
Bread, white	60	Cheese, American	15	Shredded wheat	30
Bread, whole wheat	30	Egg, whole	50	Sugar (average)	151
Butter	30	Lettuce	20	Canned tomato	60
		Milk, fluid	400	Water (average)	582

TABLE 488

William  
47 months

## BODY LENGTH AND WEIGHT—INTAKE AND ELIMINATION

Date	Recum- bent length	Weight	INTAKE		HEAT OF COMBUSTION	FECES		
			AVERAGE DAILY			AVERAGE DAILY		Laxation rate
			Dry weight	Total water	Daily intake	Wet weight	Dry weight	
mo.-day	cm.	kg.	gm.	gm.	Cal.	gm.	gm.	
3-24	109	18.60	474	1527	2149	70.4	11.2	1.3
3-27	109	19.00	455	1407	2115	90.0	13.6	1.7

The age given is the initial age at start of study. Dates given are first days of three-day balance periods.

TABLE 489

William  
47 months

## NITROGEN AND NEGATIVE MINERALS IN INTAKE, URINE, FECES

Values are averages per day

Date	NITROGEN			PHOSPHORUS			CHLORINE			SULFUR		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
3-24	8.43	6.61	1.29	1348	546	389	3273	3109	36	724	425	93
3-27	8.43	7.05	1.24	1348	559	476	3273	2674	49	724	461	126

TABLE 490

William  
47 months

## POSITIVE MINERALS IN INTAKE, URINE, FECES

*Values are averages per day*

Date	CALCIUM			MAGNESIUM			SODIUM			POTASSIUM		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
3-24	991	47	599	310	38	174	2155	1337	58	2324	3727	491
3-27	991	57	801	310	60	211	2155	1360	52	2324	2586	497

TABLE 491

William  
47 months

## NITROGEN PARTITION OF THE URINE

*Values in grams of nitrogen per day*

Date	Total nitrogen	Urea	Ammonia	Creatinine + Creatine	Creatinine	Uric acid
3-24	6.74	6.31	0.270	0.290	0.188	0.161
3-25	6.66	6.10	0.242	0.200	0.160	0.136
3-26	6.42	6.19	0.270	0.180	0.150	0.157
3-27	7.76	6.69	0.270	0.219	0.187	0.148
3-28	6.94	6.68	0.226	0.257	0.187	0.163
3-29	6.84	6.34	0.268	0.254	0.173	0.153
3-30	7.70	7.06	0.320	0.300	0.183	0.190
3-31	6.23	5.96	0.258	0.214	0.167	—
4-3	5.68	4.44	0.166	0.218	0.136	0.128

The age given is the initial age at start of study.

TABLE 492

William

RECUMBENT LENGTH AND  
WEIGHT

Age	Recumbent length	Weight
mo.-days	cm.	kg.
46-21	109.1	18.60
46-26	—	18.94

MINERAL METABOLISM OF TWELVE  
PRESCHOOL CHILDREN

*Original data collected under  
the direction of*

JULIA OUTHOUSE HOLMES, Ph.D.

*While Professor of Nutrition, Department of Home Economics, and Chief in Nutrition, Agricultural Experiment Station, College of Agriculture, University of Illinois. Since 1942, Research Professor of Nutrition, Agricultural Experiment Station, Massachusetts State College, Amherst. Member of the American Society of Biological Chemists, the American Institute of Nutrition and the Society for Research in Child Development*





*Mary*   *Peggy*   *Pat*   *Judy*   *Mae*

FIGURE 749. The girls studied at the Cunningham Home.

## PREFACE

**D**URING the three-year period between 1936 and 1939 the Department of Home Economics of the College of Agriculture at the University of Illinois conducted investigations into the mineral metabolism of healthy boys and girls of preschool age. The study was planned to contribute information to the question concerning the calcium requirement of children. A paper had just been published\* in which the conclusion was made that whereas one pint of milk daily would provide for maximal calcium retentions in well-nourished children, as much as one quart might be needed by the undernourished child. This study suggested to us that important contributions might be made to the problem if we could use, as subjects, children whose skeletal tissues were so well stocked with calcium salts that they would need calcium only for the newly developing bone and soft tissues. The major purpose of the present study therefore was to determine the minimum quantity of dietary calcium required to induce maximum calcium storage in well-nourished children. In addition, determinations for nitrogen, phosphorus and iron also were made, primarily because we wished to make maximal usage of the metabolic materials which had been accumulated at such great cost in funds, labor and planning. The importance of having data for phosphorus and nitrogen in the interpretation of calcium retentions was not appreciated until long after the study had been finished.

The studies were carried out in the Cunningham Children's Home, maintained and operated by the Methodist Conference. The purpose of that institution is to provide a temporary home for children whose families are broken, either by divorce or by the death of one member of the family. Hence, the children are expected to return to their parent as soon as a home can be re-established. The Home is notable for its intelligent attitude toward the children and their needs, and by its air of happiness, goodwill and comradeship, which prevailed among the children and their supervisors.

Had it not been for the Cunningham Children's Home and the

\* Daniels, A. L., M. K. Hutton, E. M. Knott, G. Everson and O. E. Wright. Relation of ingestion of milk to calcium metabolism in children. *Am. J. Dis. Child.*, 34: 499, 1934.

cooperation given by the Board of Trustees and by Mrs. Charlotte Fitzgerald, superintendent, this study could not have been undertaken or carried out to its successful conclusion. In addition to providing the necessary space and equipment, the Board of Trustees also served as an interpreter of our experiment to the public. Mrs. Fitzgerald, as temporary legal guardian of the children, handled all contacts with the parents. Her sympathetic understanding and faith in us, when from time to time our problems seemed insurmountable, gave us the necessary encouragement to continue the work. I welcome this opportunity to express our sincere appreciation for their contribution.

The unique approach used in this study was proposed by Dr. H. H. Mitchell of the Division of Animal Nutrition, University of Illinois. It was his suggestion that each subject be put into a well-nourished condition by feeding, at the beginning of the study, a diet generous in calcium—hence the three-month period during which the daily calcium intake approximated 1600 to 1800 mg. Moreover, the method for determining calcium utilization, i.e., the use of two levels of calcium, both in excess of the maintenance requirement, and the computation of percentage utilization on the basis of the increment in retention in relation to the increment in intake, had previously been applied by Dr. Mitchell to data relating to the calcium metabolism of farm animals.\* Obviously, much of the credit for the contributions made by this study should go to Dr. Mitchell. In addition, his helpful suggestions and constructive criticism throughout the studies were invaluable to those of us who were conducting the work.

Gladys Kinsman, Ph.D., now Professor of Nutrition at the University of Illinois, was associated with the project during the study of the girls and the first year of the study with the boys. Jointly, we were responsible for planning the details of the study and she was in charge of the chemical analyses. Her knowledge of preschool children, both from the psychological and the physical growth standpoints, was responsible for the smoothness with which the investigation progressed. Moreover, much of the success of the study was due to her familiarity with, and high standards in, the analytical phases. Grateful acknowledgment

\* Mitchell, H. H., and F. J. McClure. Mineral nutrition of farm animals. Bulletin National Research Council No. 99, Washington, 1937.



is made for her many contributions throughout the experiment and during these past months, while the original records were being compiled for inclusion in this volume.

Dr. Kinsman and Dorothy Sheldon, M.S., together, supervised the analytical work of the laboratory during the first two years of the study, and, assisted by Janice Smith, M.S., were responsible for the preparation of the metabolic materials for analysis. The calcium analyses were carried out by Dr. Kinsman, Miss Sheldon, Elizabeth Jensen, B.S., and Herta Breiter, B.S. The phosphorus balances were determined by Milicent Hathaway, Ph.D., Irene J. Twomey, M.S., Marie Bernds, M.S., Rosalind Mills, M.S., Beula McKey, B.S., and Marjorie Pickens, Ph.D. Elizabeth Kempster, M.S., made the nitrogen assays during the studies of both the girls and the boys. Miss Jensen determined the creatine and creatinine excretions for the girls. During the third year of the study Miss Mills and Miss Kempster were responsible for the preparation of the metabolic materials for analysis. Whereas each person was responsible for a specific portion of the work, all were familiar with the other phases of the analytical procedures and it was the interest which these young women had in the study, their dependability and versatility and above all, their willingness to work overtime whenever the occasion demanded, which insured the progress of the analytical work on schedule. Their contribution to the study cannot be overestimated.

The preparation of the food and the care of the children was in the hands of Frances Utterback Crane, B.S., Helen King, B.S., Marie Bernds, M.S., Nellie Ratcliffs, B.S., and Charlotte Beard, B.S., all of whom were graduates of the curriculum in home economics at the University of Illinois. The success of the entire investigation depended on their careful collection of the metabolic materials for analysis. The fact that so few errors occurred in these long-time studies is a testimonial to their accuracy, dependability, and interest in the project and the children.

Dr. James B. Gillespie, pediatrician of the Carle Memorial Clinic, Urbana, Illinois, kindly gave his services in examining the children before the studies started and from time to time as they progressed. Dr. C. Gianturco, roentgenologist at the same clinic, contributed the roentgenograms of the hands of the girls. Dental

care was provided during the first year by the late Dr. E. P. Little and later by Dr. J. B. Ruyle, dentists practicing in the Champaign-Urbana district.

The major expenses of the study were defrayed by funds allotted by the Illinois Agricultural Experiment Station, for research in nutrition in the Department of Home Economics. We are grateful to Professor Lita Bane, Head of the Home Economics Department and to the late Dean Herbert Mumford and to Dean J. C. Blair, directors of the Experiment Station during the time of the study, for their interest in the study and their willingness to devote such a large portion of research funds to it. In addition, throughout the three years, special funds were made available by the American Dry Milk Institute, Inc. Grateful acknowledgment is herewith made to the Research Board of that company and to Mr. R. McCann, director, for their contribution.

The department of Home Economics and the Illinois Agricultural Experiment Station wish to acknowledge their indebtedness to the Children's Fund of Michigan for the opportunity to publish, in detail, these data on the mineral metabolism of the 12 children.

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*Research Professor in Nutrition*  
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Amherst



## PROCEDURE AND METHODS

THE subjects used in the investigations were five healthy preschool girls and seven boys. The girls were studied for 32 consecutive weeks; later, the boys composed a study group for 72 consecutive weeks. While the studies were still in the planning stage the intention was to exercise rigid control in the selection of the subjects, with respect to age, weight and body type. Actually, however, too few preschool age children had been assigned to the Home, for a period sufficiently extended to make them suitable as subjects, to allow any selection whatsoever. DeWayne was temporarily transferred from the County Children's Home for the express purpose of being one of the subjects and the two brothers, Orville and George, were included in the group on the very day that they were admitted into the Home. Because of the scarcity of children of a suitable age, the subjects were not as uniform in size, weight and nutritional background as desired.

For our study on calcium metabolism the type of food habitually served in the Children's Home was fortunate. The Home had its own dairy herd, consequently, milk formed a substantial part of the regular diet. Not only were pitchers of milk on the table at all three meals and all children required to drink some milk, but also cream soups or bread and milk formed one of the meals each day. Thus, there was good reason for believing that, with the possible exception of the three recently admitted children, the subjects had unusually good stores of calcium in their bones, even before the experiment started.

The space arranged for us at the Children's Home consisted of a separate bathroom for the children, a large room which served both as kitchen and dining room, a dormitory with individual beds for each child, a large play room, and a room for one attendant. Although the quarters were unpretentious they satisfied the needs of the children and of our investigation. During the studies every effort was made not to disturb the usual activities of the children. The playroom and playground had suitable but simple play materials. Each morning and afternoon, summer and winter, the children were out of doors when it was not rain-

ing or snowing. On Sunday the children went to Sunday School, accompanied by their attendant, with a collection of bottles for emergency use. Occasionally, entertainments for the children were given by various groups of townspeople and our children participated in everything but the refreshments.

### Purposes of Study

One of the purposes of the studies was to determine the maximum rate of calcium retention by well-nourished children and to find the minimum daily intake of calcium required to maintain it. During the first part of the investigation, an attempt was made to saturate the body tissues with calcium by feeding generous quantities over a comparatively long period of time, with the hope that subsequent calcium retentions would be representative of the calcium needs of developing tissue.\* An attempt was also made to determine the extent of the utilization of the calcium of milk by preschool children. The calcium level was changed from period to period by changing the quantity of dry milk solids consumed. These increments in calcium were planned to give significant differences in retention and at the same time to keep the highest level of intake below the minimum requirement for maximum retention.†

The question arose whether the pure calcium salts, which are frequently recommended by physicians as a supplement to the diet, compare favorably with milk in providing assimilable calcium. Di-calcium phosphate was selected for study because of its relatively high calcium and phosphorus content, its palatability and its low cost. For intervals of from 7 to 13 weeks, each of six boys was given, daily, 126 mg. of calcium in the form of  $\text{CaHPO}_4$ . The calcium salt was weighed in weekly allotments of exactly 3.8 gm. for each child; this amount was divided into seven approximately equal parts, each of which was placed in a gelatin capsule. One capsule was given each morning at breakfast.‡

To test the effect, if any, of lactose on calcium metabolism,

\* Outhouse, J., G. Kinsman, D. Sheldon, I. Twomey, J. Smith and H. H. Mitchell. The calcium requirements of five preschool girls. *J. Nutrition*, 17: 199, 1939.

† Kinsman, G., D. Sheldon, E. Jensen, M. Bernds, J. Outhouse and H. H. Mitchell. The utilization of the calcium of milk by pre-school children. *J. Nutrition*, 17: 429, 1939.

‡ Kempster, E., H. Breiter, R. Mills, B. McKey, M. Bernds and J. Outhouse. The utilization of the calcium of di-calcium phosphate by children. *J. Nutrition*, 20: 279, 1940.

five of the boys were given thirty-six grams of lactose per day.\* This amount of lactose, plus that of the milk solids of the basal dietary, approximated the quantity of lactose contained in one quart of milk. The milk sugar was ash-free and contained no sterols. The quantity of sucrose which the children had been allowed in their basal diet was decreased by an amount equivalent to the added lactose so that the intake of di-saccharides would remain constant.

### Foods and Feeding

Each child's food was prepared separately. This necessitated weighing the foods before they were cooked and had an advantage in that, once the foods were cooked, they could be served immediately. For the few foods which were to be served mashed, group cooking was used. For preparing the individual foods, pyrex frying pans, casseroles and ramekins were used and the foods were served in the dishes in which they were cooked. All residues remaining after each meal were carefully removed with distilled water (and a rubber policeman) and sent to the laboratory for analysis.

The same basal diet was fed throughout the study. Balances were determined on the basis of 7-day periods. Seven different groups of food were selected (one for each day of the week) and these were repeated each week of the experiment. Carmine markers were given with breakfast the first morning of each period. Since during one phase of the investigation the plan was to feed calcium at a very low level, only low-calcium foods were permissible. For this reason few vegetables, especially those of the leafy type, were included. A small portion of milk solids, equivalent to about 200 ml. of fluid milk, was allowed daily for cooking purposes. A prime requirement of the diet was that it must provide the essential nutriments other than calcium. Since few vegetables and only small amounts of milk were allowed, it seemed advisable to supplement the natural foods with concentrates. Thus, cod-liver oil, ferric chloride, and ascorbic acid were given daily. In the study with girls, tiki tiki was fed. The acceptability of the foods to the children and their availability at all seasons of the year were considered in selecting the foods in the basal dietary.

\* Mills, R., H. Breiter, E. Kempster, B. McKey, M. Pickens and J. Outhouse. The influence of lactose on calcium retentions in children. *J. Nutrition*, 20: 467, 1940.



To meet individual caloric demands, bread, butter fat, sugar (C.P.) and jelly were allowed *ad libitum*. Bread was weighed as used; butter fat, sugar and jelly were weighed at beginning and end of each week; distilled water was used for cooking and drinking purposes as well as for rinsing the dishes.

The foods were sampled for analysis at the time they were weighed for cooking. To insure uniformity in the composition of the diets, the meats were put through the grinder three times, leafy vegetables were shredded, and other vegetables were either diced, sliced or mashed. Between the preparation and the weighing, the foods were kept fresh and crisp by wrapping them in damp towels or in wax paper. Any adhering droplets of moisture were carefully removed before weighing. The food portions weighed for analysis were placed in the food-composite casserole, covered with oiled silk, and kept in an electric refrigerator. The composite for the preceding day was sent to the laboratory each morning.

### Collection of Excreta

Straight-sided glass specimen jars approximately 6 inches in diameter and 4 inches high were used for both urine and stool collection from the girls; the kidney secretions and feces being collected separately. These jars were also used to collect the boys' stools. Both the girls and the boys preferred to have the jars placed on the floor, although a specially constructed rack was available under the toilet seat. The jars, each containing only the feces from a single defecation, were retained, covered, in a refrigerator pending transportation to the laboratory. The urine of the boys was collected through a 150 mm. funnel into a 2.5 liter bottle. The bottles for the 24-hour urine collections were rinsed in 5 per cent thymol and dried. The excreta for each 24-hour period was transported to the laboratory each morning and immediately prepared for analysis.

### Preparation of Samples

**Food:** The composite samples of food weighed out each day were transferred to casseroles and treated with dilute HCl (1:9), according to the method of Stearns.\* At the end of each seven

\* Stearns, G. A rapid gravimetric method for the preparation of food digests suitable for use in nitrogen and mineral analyses. *J. Lab. Clin. Med.* 14: 956, 1929.

days the viscous digest was forced through a 1 mm.-pore Büchner funnel (removable plate). The small amount of material which was too coarse to pass through the funnel was ashed and added to the sample. The combined sample was divided into two approximately equal parts and each was made up to 4 liters with redistilled water. Each part was analyzed in triplicate and the six determinations were averaged. The material, now in a fairly fluid condition, was sampled with pipettes which had wide tips and had been carefully calibrated. Each baking of bread was analyzed. Representative slices from each loaf of each batch were weighed and later dried in an electric oven, finely ground in a mortar, digested over night with dilute HCl (1:9), filtered through a 1 mm.-pore Büchner funnel, and made to volume. All samples were withdrawn with calibrated pipettes with wide tips.

The dishwashings collected for each period were evaporated to dryness in Kjeldahl flasks and digested with a 1:1 mixture of concentrated sulfuric and nitric acids. The digest solution was transferred to a 500 ml. volumetric flask and made up to volume. The calcium in the dishwashings was deducted from the total intake values for calcium.

**Excreta:** The feces excreted prior to emergence of each carmine marker were combined for the preceding balance period and digested with dilute HCl (1:9) on a steam bath. The digest was filtered through a Büchner funnel; the residual material was ashed in a muffle furnace and added to the sample, which was then made up to 2000 ml. The total 24-hour collection of urine was made up to 1500 ml. with redistilled water. Of this sample, a 100 ml. aliquot was taken for the composite to be analyzed at the end of the period.

## Chemical Methods

**Calcium:** The samples were evaporated to dryness over a steam bath, ashed in a muffle furnace at 600° C. and treated for the removal of silicates according to the Frear and Kahlenberg method,\* before determination of calcium by the McCrudden method.† Di-brom cresol purple was used as an indicator, and

\* Frear, D. E. N., and O. J. Kahlenberg. A study of the accuracy of the McCrudden method for calcium and magnesium in biological materials. *J. Biol. Chem.* 100: 85. 1933.

† McCrudden, F. H. The determination of calcium in the presence of magnesium and phosphates: The determination of calcium in urine. *J. Biol. Chem.* 10: 187, 1911-12.



the calcium was titrated with a standard solution of potassium permanganate.

**Phosphorus:** The phosphorus was determined according to the method of Meigs, Blatherwick and Cary,\* with slight modifications. Only one precipitation with  $(\text{NH}_4)_6\text{MO}_7\text{O}_{24}$  was used in this study since no advantage was found in the double precipitation as prescribed by these authors.

All of the materials were sampled in triplicate into 500 ml. Kjeldahl flasks and digested with 25 ml. of 1:1 mixture of concentrated  $\text{H}_2\text{SO}_4$  and  $\text{HNO}_3$ . If the samples did not become colorless in a reasonable length of time the flasks were cooled and 5 to 10 ml. of concentrated  $\text{HNO}_3$  were added. When digestion was complete, 50 ml. of water were added and the solution reheated for 15 to 30 minutes. The contents of the flask were quantitatively transferred into 400 ml. beakers. The samples were then diluted to 200 ml. with redistilled water. The solution was heated to boiling immediately upon adding 30 ml. of 33 per cent  $\text{NH}_4\text{NO}_3$ , after which 40 ml. of 8.6 per cent  $(\text{NH}_4)_6\text{NO}_7\text{O}_{24}$  were added slowly with stirring. The mixture was again brought to boiling and stirred for about two minutes to insure more nearly complete precipitation of the ammonium phosphomolybdate; it was then allowed to stand over night.

The precipitate was decanted into Munktell's (No. OK) low-ash filter paper and washed once with 25 ml. of wash liquid (100 gm. of  $\text{NH}_4\text{NO}_3$  and 80 ml. of 70 per cent  $\text{HNO}_3$  in 2 liters of water). The precipitate was dissolved in a minimum amount of 2.5 per cent  $\text{NH}_4\text{OH}$  and 35 per cent  $\text{HCl}$  was added dropwise until the precipitate formed from one drop dissolved very slowly. Then 5 ml. of magnesia mixture (110 gm. of  $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$ , 210 gm. of  $\text{NH}_4\text{Cl}$ , and 4 ml. of 35 per cent  $\text{HCl}$  made up to 2 liters with water) were added slowly. Two drops of one per cent phenolphthalein were added as an indicator, the mixture was heated to boiling, and 10 ml. of 28 per cent  $\text{NH}_4\text{OH}$  added. The resulting precipitate was stored in an ice box over night. Before the final filtration through low-ash filter paper, 10 ml. of 28 per cent  $\text{NH}_4\text{OH}$  were added, and the precipitate was subsequently washed with 2.5 per cent  $\text{NH}_4\text{OH}$  until the filtrate was free of chlorides. The paper and precipitate were placed in a tared

\* Meigs, E. B., N. R. Blatherwick and C. A. Cary. Contributions to the physiology of phosphorus and calcium metabolism as related to milk secretion. *J. Biol. Chem.*, 37: 1, 1919.

crucible and charred over a low flame to prevent ignition of the filter paper. The residue was ignited at 800° C. in a muffle furnace to a white ash. The final product (magnesium pyrophosphate) was weighed and the amount of phosphorus computed (weight  $\text{Mg}_2\text{P}_2\text{O}_7 \times 0.2784 = \text{P}$ ).

**Nitrogen:** The Kjeldahl method for the determination of nitrogen was used. The samples were digested with 20 ml. of concentrated sulfuric acid, approximately 10 grams of sodium sulphate, and 3 ml. of a 10 per cent solution of copper sulphate. About 300 ml. of redistilled water was added. For the distillation a small amount of pumice stone powder was used to prevent bumping. Sixty cubic centimeters of concentrated sodium hydroxide were added and the mixture distilled into standardized sulfuric acid. The excess acid was titrated with sodium hydroxide, using a mixture of methyl red and methylene blue as an indicator. The indicator was prepared by mixing 0.125 grams of methyl red and 0.0825 grams of methylene blue and diluting to 100 ml. with 90 per cent alcohol.

All determinations were done in triplicate, and those determinations which varied by more than one per cent were discarded. A set of three blanks was run for each group of analyses and the value obtained subtracted from that of each sample.

TABLE 493  
 AVERAGE DAILY INTAKE OF FOODS IN BASAL DIETARY  
 BY MARY, JUDY, MAE, PAT, PEGGY  
*Values in grams per day*

FOOD*	DATE				
	10-14 to 1-20	1-20 to 3-24	3-24 to 4-28	4-28 to 5-5	5-5 to 6-9
Apple sauce	36	36	36	36	36
Apricots	3	3	3	3	3
Ascorbic acid	0.1	0.1	0.1	0.1	0.1
Banana	27	27	27	27	27
Beans, green	7	7	7	7	7
Beef, dried	6	6	6	6	0
Beef, ground	26	26	26	26	34
Cabbage	7	7	7	7	7
Cornmeal	3	3	3	3	3
Carrot	4	4	4	4	4
Casein	10	10	3	0	0
Chicken	8	8	8	8	8
Chicken broth	14	14	14	14	14
Di-calcium phosphate	5	0	0	0	0
Egg white	68	68	68	68	34
Egg yolk	16	16	16	16	16
Farina	6	6	6	6	6
Fruit juice, mixed	14	14	14	14	14
Grapefruit	13	13	13	13	13
Grapefruit juice	2	2	2	2	2
Lemon juice	6	6	6	6	6
Lettuce	1	1	1	1	1
Liver, beef	8	8	8	8	8
Macaroni	2	2	2	2	2
Oatmeal	4	4	4	4	4
Peach	14	14	14	14	14
Pear	25	25	25	25	25
Pear juice	2	2	2	2	2
Pineapple	11	11	11	11	11
Pineapple juice	1	1	1	1	1
Potato, Irish	75	75	75	75	75
Potato, Sweet	11	11	11	11	11
Prunes	9	9	9	9	9
Rice	6	6	6	6	6
Spaghetti	4	4	4	4	4
Tapioca	1	1	1	1	1
Tomato juice	36	36	36	36	36
Tuna fish	8	8	8	8	8

\* Not all of the foods were given every day in the periods. Seven diets, one for each day of the week, were repeated during each seven-day period. The averages given are one-seventh of the total intake of a food during each period.



MAE

FIGURE 750. Actual size reproduction of roentgenogram of hand.  
Chronological age 39 months.



MAE

FIGURE 751. Actual size reproduction of roentgenogram of hand. Chronological age 45 months.



TABLE 494

Mae

## MEASUREMENTS OF THE BONES OF THE WRIST

Age, months	39	45	Age, months	39	45
Carpals			Carpals		
Area, sq. mm.			Greatest diameter, mm.		
Hamate	45	46	Hamate	9	9
Capitate	61	73	Capitate	11	12
Lunate	6	8	Lunate	2	3
Triangular	16	18	Triangular	4	5
Ulna			Epiphyses		
Diameter, mm.			1st Metacarpal	5	6
Distal epiphysis	0	0	2nd Metacarpal	6	6
Distal metaphysis	11	11	3rd Metacarpal	6	6
Radius			4th Metacarpal	5	5
Diameter, mm.					
Distal epiphysis	13	14	Wrist area,* sq. mm.	772	802

\* Measured with the planimeter using Flory's landmarks (Monographs of the Society for Research in Child Development Vol. I, No. 3, 1936).

TABLE 495

Mae  
40 monthsAVERAGE DAILY INTAKE OF FOODS NOT INCLUDED  
IN BASAL DIET*Values in grams per day*

Date	Milk solids	Butter	Bread	Sugar	Jelly	Corn starch	Water
10-14	21	23	28	24	60	4	600
10-21	21	24	24	26	42	4	786
10-28	21	19	8	34	31	6	714
11-4	21	20	13	32	23	4	657
11-11	21	20	14	10	21	5	714
11-18	21	16	17	30	24	7	693
11-25	21	25	26	32	21	7	657
12-2	21	22	30	28	28	6	543
12-9	21	18	26	40	15	7	571
1-13	21	21	16	22	17	6	743
1-20	21	24	31	21	28	6	864
1-27	21	23	33	20	28	6	771
2-3	21	25	37	20	36	6	728
2-10	21	24	43	19	36	6	850
2-17	21	25	36	18	36	7	721
2-24	21	25	46	11	30	7	757
3-3	21	24	17	15	16	7	721
3-10	21	25	28	18	28	7	721
3-17	21	22	20	21	18	8	771
3-24	42	20	16	38	21	8	743
3-31	42	22	31	21	21	8	836
4-7	42	25	18	21	21	6	721
4-14	42	25	10	21	6	8	728
4-21	42	22	17	21	14	8	725
4-28	63	12	6	21	14	8	771
5-5	63	13	31	21	14	7	757
5-12	63	21	13	21	11	7	757
5-19	60	15	20	21	8	7	786

TABLE 496

Mae  
40 months

## BODY WEIGHT

Date	kg.	Date	kg.	Date	kg.
11-17	14.06	1-20	13.38	3-24	13.61
11-24	14.29	1-27	12.25	3-31	13.83
12-1	14.51	2-3	13.38	4-7	13.61
				4-14	14.06
12-8	14.74	2-10	13.38	4-21	13.61
12-15	14.51	2-17	13.15		
12-22	13.61	2-24	13.38	4-28	13.61
				5-5	13.61
12-29	14.51	3-3	13.61	5-12	13.61
1-6	13.15	3-10	13.15	5-19	14.51
1-13	13.15	3-17	13.61	5-26	13.61

TABLE 497

Mae  
40 months

## URINE CREATININE PER 24 HOURS

Date	mg.	Date	mg.	Date	mg.	Date	mg.
9-30	206	10-31	235	11-23	294	—	—
10-1	330	11-1	324	11-24	319	1-13	225
10-2	314	11-2	260	11-25	224	1-14	284
10-3	324	11-3	268	11-26	251	1-15	300
10-4	299	11-4	220	11-27	302	1-16	366
10-5	218	11-5	232	11-28	316	1-17	333
10-14	217	11-6	305	11-29	363	1-18	287
10-15	260	11-7	267	11-30	270	1-19	288
10-16	268	11-8	310	12-1	296	1-20	207
10-17	236	11-9	312	12-2	225	1-21	276
10-18	260	11-10	274	12-3	245	1-22	300
10-19	259	11-11	228	12-4	302	1-23	318
10-20	257	11-12	230	12-5	312	1-24	360
10-21	229	11-13	308	12-6	347	1-25	322
10-22	250	11-14	263	12-7	283	1-26	302
10-23	272	11-15	346	12-8	315	1-27	233
10-24	284	11-16	285	12-9	220	1-28	274
10-25	250	11-17	241	12-10	250	1-29	293
10-26	242	11-18	218	12-11	303	1-30	272
10-27	246	11-19	218	12-12	310	1-31	347
10-28	206	11-20	286	12-13	348	2-1	318
10-29	244	11-21	254	12-14	288	2-2	324
10-30	276	11-22	350	12-15	288		

TABLE 498

Mae  
40 monthsNITROGEN, CALCIUM, PHOSPHORUS IN INTAKE,  
URINE, FECES*Values are averages per day*

Date	NITROGEN			CALCIUM			PHOSPHORUS		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.
10-14	8.04	5.88	1.13	1796	84	1705	1855	579	1201
10-21	8.06	6.40	0.98	1814	75	1514	1847	639	1147
10-28	7.69	6.46	0.98	1803	65	1717	1839	625	1262
11-4	7.86	6.85	0.90	1806	46	1406	1859	525	1095
11-11	7.97	6.77	0.84	1796	49	1418	1844	584	1063
11-18	7.50	6.77	0.98	1809	60	1734	1860	553	1311
11-25	8.30	7.13	0.95	1801	58	1646	1861	567	1272
12-2	8.17	6.68	1.01	1812	56	1724	1851	515	1284
12-9	7.80	6.45	1.00	1799	56	1691	1934	514	1274
***									
1-13	6.02	6.58	0.89	1802	61	1692	1851	592	1212
1-20	8.36	6.75	—	1806	64	1739	1856	555	1277
1-27	7.84	7.23	0.88	355	61	271	728	430	273
2-3	7.79	6.80	0.91	354	64	244	729	396	274
2-10	8.20	6.79	0.88	357	58	278	723	361	276
2-17	8.10	6.35	0.76	350	58	234	698	413	245
2-24	8.58	7.53	0.83	363	59	257	652	360	283
3-3	7.82	7.12	0.75	350	58	252	699	413	274
3-10	8.05	7.03	0.75	352	62	221	719	363	257
3-17	7.86	7.19	0.72	346	59	215	698	364	246
3-24	8.08	6.61	0.93	601	60	431	887	403	349
3-31	8.58	7.26	0.79	605	73	446	914	453	348
4-7	8.24	7.48	0.85	606	77	457	895	503	361
4-14	7.92	6.78	0.85	594	65	452	869	465	356
4-21	7.94	7.10	0.88	601	65	462	872	488	321
4-28	8.79	7.48	0.81	855	82	715	1072	525	477
5-5	8.36	7.30	0.81	862	62	706	1097	548	457
5-12	7.98	6.99	0.89	844	54	774	1039	505	510
5-19	8.08	7.02	0.76	888	73	643	1064	642	426

\*\*\* Collection of samples suspended to allow laboratory staff to "catch up" with analyses. Regular diet procedure was maintained.



MARY

FIGURE 752. Actual size reproduction of roentgenogram of hand.  
Chronological age 37 months.



MARY

FIGURE 753. Actual size reproduction of roentgenogram of hand.  
Chronological age 43 months.



TABLE 499

Mary

MEASUREMENTS OF THE BONES OF THE WRIST

Age, months	37	43	Age, months	37	43
Carpals			Carpals		
Area, sq. mm.			Greatest diameter, mm.		
Hamate	45	49	Hamate	9	9
Capitate	58	70	Capitate	10	11
Ulna			Epiphyses		
Diameter, mm.			1st Metacarpal	2	3
Distal epiphysis	0	0	2nd Metacarpal	5	6
Distal metaphysis	12	12	3rd Metacarpal	5	6
Radius			4th Metacarpal	3	4
Diameter, mm.			Wrist area,* sq. mm.	805	806
Distal epiphysis	11	12			

\* Measured with the planimeter using Flory's landmarks (Monographs of the Society for Research in Child Development Vol. I, No. 3, 1936).

TABLE 500

Mary  
37 months

AVERAGE DAILY INTAKE OF FOODS NOT INCLUDED  
IN BASAL DIET

*Values in grams per day*

Date	Milk solids	Butter	Bread	Sugar	Jelly	Corn starch	Water
10-14	21	23	35	24	60	4	583
10-21	21	25	37	28	54	5	586
10-28	21	17	6	39	9	6	568
11-4	21	19	14	31	23	3	457
11-11	21	28	28	10	28	4	514
11-18	21	17	21	28	28	7	536
11-25	21	25	24	33	22	7	443
12-2	21	25	37	29	28	6	528
12-9	21	21	27	43	24	6	500
12-16	21	25	21	30	21	6	686
1-13	21	22	31	22	31	6	821
1-20	21	27	14	22	17	6	721
1-27	21	24	31	19	31	6	721
2-3	21	26	37	20	36	6	821
2-10	21	24	47	19	36	6	771
2-17	21	25	47	18	36	7	836
2-24	21	25	47	12	36	7	771
3-3	21	25	40	15	36	7	800
3-10	21	25	26	18	36	7	843
3-17	21	25	30	21	36	8	800
3-24	42	20	13	38	13	8	721
3-31	42	21	24	21	19	8	771
4-7	42	25	36	21	36	6	728
4-14	42	25	18	21	19	8	800
4-21	42	23	21	21	13	8	704
4-28	63	21	29	21	21	6	725
5-5	63	14	20	21	21	7	686
5-12	63	21	28	21	21	7	828
5-19	60	21	28	21	8	7	707

TABLE 501

Mary  
37 months

## BODY WEIGHT

Date	kg.	Date	kg.	Date	kg.
11-17	14.51	1-20	14.06	3-24	14.51
11-24	14.97	1-27	13.83	3-31	14.06
12-1	15.20	2-3	14.06	4-7	14.29
12-8	15.42	2-10	14.06	4-14	15.42
12-15	15.42	2-17	13.83	4-21	14.51
12-22	14.97	2-24	14.06	4-28	15.20
12-29	15.42	3-3	14.97	5-5	14.74
1-6	13.83	3-10	14.51	5-12	15.20
1-13	13.61	3-17	14.97	5-19	15.88
				5-26	15.42

TABLE 502

Mary  
37 months

## URINE CREATININE PER 24 HOURS

Date	mg.	Date	mg.	Date	mg.	Date	mg.
10-14	207	11-6	292	11-29	365	12-22	286
10-15	240	11-7	311	11-30	282	—	—
10-16	267	11-8	319	12-1	295	1-13	222
10-17	243	11-9	338	12-2	222	1-14	284
10-18	260	11-10	266	12-3	252	1-15	292
10-19	244	11-11	236	12-4	298	1-16	332
10-20	254	11-12	252	12-5	293	1-17	348
10-21	225	11-13	302	12-6	342	1-18	329
10-22	237	11-14	248	12-7	285	1-19	329
10-23	271	11-15	351	12-8	304	1-20	225
10-24	280	11-16	250	12-9	224	1-21	310
10-25	251	11-17	245	12-10	236	1-22	289
10-26	252	11-18	225	12-11	302	1-23	292
10-27	232	11-19	226	12-12	286	1-24	354
10-28	211	11-20	279	12-13	350	1-25	290
10-29	250	11-21	264	12-14	306	1-26	295
10-30	267	11-22	356	12-15	287	1-27	227
10-31	238	11-23	282	12-16	226	1-28	274
11-1	306	11-24	306	12-17	261	1-29	302
11-2	274	11-25	220	12-18	294	1-30	321
11-3	225	11-26	252	12-19	250	1-31	387
11-4	204	11-27	308	12-20	280	2-1	292
11-5	234	11-28	318	12-21	254	2-2	272

TABLE 503

Mary  
37 monthsNITROGEN, CALCIUM, PHOSPHORUS IN INTAKE,  
URINE, FECES*Values are averages per day*

Date	NITROGEN			CALCIUM			PHOSPHORUS		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.
10-14	8.17	6.30	1.09	1800	55	1623	1881	543	1177
10-21	8.29	6.99	0.94	1821	47	1655	1865	589	1303
10-28	7.64	6.81	0.65	1798	34	1570	1834	494	1238
11-4	7.88	7.22	1.00	1809	36	1612	1863	529	1318
11-11*	8.36	6.42	0.98	1797	31	1604	1861	533	1174
11-18	7.57	6.92	1.00	1816	45	1688	1870	578	1298
11-25	8.28	6.81	1.01	1803	36	1698	1861	498	1325
12-2	8.28	6.73	0.97	1815	38	1520	1856	477	1206
12-9	7.84	6.66	0.95	1802	43	1704	1937	563	1277
12-16	7.69	6.65	0.98	1795	32	1662	1850	535	1269
†††									
1-13	—	—	—	1811	31	1765	1870	530	1279
1-20	—	—	—	1786	25	1792	—	512	—
1-27	7.82	6.97	0.80	354	36	242	726	441	248
2-3	7.54	6.66	1.10	354	49	290	729	411	298
2-10	8.28	6.75	0.88	359	48	261	729	374	279
2-17	8.28	6.54	0.81	357	59	238	713	393	249
2-24	8.60	6.84	0.82	363	30	240	653	371	264
3-3	8.21	6.61	0.84	363	42	249	732	386	276
3-10	8.00	6.57	0.82	352	29	222	716	358	249
3-17	8.02	6.90	0.72	353	32	208	712	425	233
3-24	8.03	6.77	0.89	599	36	426	884	433	349
3-31	8.47	6.99	0.78	601	36	430	904	391	344
4-7	8.50	7.29	0.83	615	57	445	916	530	343
4-14	8.06	6.77	0.82	599	32	466	883	476	338
4-21	8.01	7.21	0.76	604	40	469	880	485	340
4-28	9.15	7.67	0.90	865	53	737	1099	513	495
5-5	8.19	7.21	0.83	855	34	753	1082	530	478
5-12	8.41	6.97	0.92	847	36	727	1058	589	491
5-19	8.21	7.41	0.64	891	43	642	1077	535	415

\* Four-day period.

††† Collection of samples suspended to allow laboratory staff to "catch up" with analyses. Regular diet procedure was maintained.



JUDY

FIGURE 754. Actual size reproduction of roentgenogram of hand.  
Chronological age 54 months.



JUDY

FIGURE 755. Actual size reproduction of roentgenogram of hand.  
Chronological age 60 months.



TABLE 504

Judy

MEASUREMENTS OF THE BONES OF THE WRIST

Age, months	54	60	Age, months	54	60
Carpals			Carpals		
Area, sq. mm.			Greatest diameter, mm.		
Hamate	55	56	Hamate	9	10
Capitate	66	72	Capitate	11	11
Navicular	4	10	Navicular	2	3
Lunate	18	23	Lunate	5	6
Triangular	12	16	Triangular	4	5
Ulna			Epiphyses		
Diameter, mm.			1st Metacarpal	5	6
Distal epiphysis	0	0	2nd Metacarpal	6	7
Distal metaphysis	12	13	3rd Metacarpal	6	7
Radius			4th Metacarpal	5	5
Diameter, mm.			Wrist area,* sq. mm.	812	868
Distal epiphysis	15	17			

\* Measured with the planimeter using Flory's landmarks (Monographs of the Society for Research in Child Development Vol. I, No. 3, 1936).

TABLE 505

Judy  
54 months

AVERAGE DAILY INTAKE OF FOODS NOT INCLUDED  
IN BASAL DIET

Values in grams per day

Date	Milk solids	Butter	Bread	Sugar	Jelly	Corn starch	Water
10-14	21	23	34	24	60	4	657
10-21	21	25	47	28	54	4	693
10-28	21	32	51	40	57	6	743
11-4	21	30	54	32	57	4	700
11-18	21	20	37	29	53	8	814
11-25	21	32	57	31	53	7	657
12-2	21	28	63	29	57	7	600
12-9	21	22	40	40	32	7	657
12-16	21	31	30	27	40	6	657
1-13	21	25	11	22	18	6	828
1-20	21	28	38	21	36	6	814
1-27	21	29	68	19	57	6	714
2-3	21	25	86	19	57	6	800
2-10	21	31	81	18	57	6	728
2-17	21	32	67	18	57	7	828
2-24	21	32	93	12	57	7	800
3-3	21	32	83	17	57	7	864
3-10	21	32	66	19	57	7	843
3-17	21	32	61	21	57	8	900
3-24	42	29	43	28	33	8	800
3-31	42	32	48	21	57	8	857
4-7	42	32	53	21	54	6	857
4-14	42	32	37	21	38	8	886
4-21	42	26	34	21	28	8	846
5-12	63	25	57	21	50	7	828
5-19	60	25	47	21	50	7	928
5-26	60	25	76	21	50	7	1021
6-2	60	25	84	21	43	7	857

TABLE 506

Judy  
54 months

## BODY WEIGHT

Date	kg.	Date	kg.	Date	kg.
11-17	17.69	1-27	15.42	4-7	17.69
11-24	17.92	2-3	16.78	4-14	18.14
12-1	17.92	2-10	16.10	4-21	18.37
12-8	18.14	2-17	16.10	4-28	17.69
12-15	18.37	2-24	17.01	5-5	17.01
12-22	17.46	3-3	17.24	5-12	17.24
12-29	18.37	3-10	17.01	5-19	17.69
1-6	16.10	3-17	17.69	5-26	17.24
1-13	16.78	3-24	17.46	6-2	17.69
1-20	16.56	3-31	17.69	6-9	17.92

TABLE 507

Judy  
54 months

## URINE CREATININE PER 24 HOURS

Date	mg.	Date	mg.	Date	mg.	Date	mg.
10-14	203	11-6	331	11-29	400	12-22	316
10-15	268	11-7	279	11-30	288	—	—
10-16	324	11-8	350	12-1	332	1-13	268
10-17	276	11-9	356	12-2	240	1-14	356
10-18	276	11-10	286	12-3	264	1-15	412
10-19	265	11-11	234	12-4	369	1-16	404
10-20	252	11-12	282	12-5	314	1-17	377
10-21	251	11-13	319	12-6	380	1-18	320
10-22	259	11-14	290	12-7	314	1-19	318
10-23	291	11-15	378	12-8	330	1-20	258
10-24	295	11-16	333	12-9	240	1-21	328
10-25	282	11-17	262	12-10	266	1-22	328
10-26	294	11-18	234	12-11	339	1-23	345
10-27	248	11-19	238	12-12	335	1-24	410
10-28	221	11-20	318	12-13	340	1-25	335
10-29	255	11-21	291	12-14	326	1-26	324
10-30	318	11-22	411	12-15	292	1-27	250
10-31	294	11-23	317	12-16	234	1-28	301
11-1	357	11-24	344	12-17	275	1-29	332
11-2	306	11-25	249	12-18	280	1-30	347
11-3	302	11-26	273	12-19	254	1-31	452
11-4	216	11-27	340	12-20	354	2-1	353
11-5	252	11-28	352	12-21	292	2-2	363

TABLE 508

Judy  
54 monthsNITROGEN, CALCIUM, PHOSPHORUS IN INTAKE,  
URINE, FECES*Values are averages per day*

Date	NITROGEN			CALCIUM			PHOSPHORUS		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.
10-14	8.15	6.35	0.98	1799	80	1696	1866	674	1134
10-21	8.47	7.12	0.99	1826	84	1644	1880	733	1199
10-28	8.35	6.70	1.10	1825	75	1623	1899	711	1155
11-4	8.50	7.21	1.07	1828	91	1718	1916	620	1323
—	—	—	—	—	—	—	—	—	—
11-18	7.85	7.07	1.02	1824	91	1565	1890	688	1155
11-25	8.83	7.04	0.95	1821	81	1506	1908	679	1157
—	—	—	—	—	—	—	—	—	—
12-2	8.68	7.23	0.97	1829	80	1556	1895	671	1109
12-9	8.01	6.74	0.97	1803	65	1431	1953	716	1011
12-16	7.85	6.35	1.18	1801	54	1587	1861	606	1169
***	—	—	—	—	—	—	—	—	—
1-13	—	—	—	1798	59	1559	1844	644	1136
1-20	—	—	—	1808	63	1598	1859	686	1177
1-27	8.35	7.66	0.84	375	55	238	774	495	232
—	—	—	—	—	—	—	—	—	—
2-3	8.50	7.25	0.80	380	73	208	797	431	196
2-10	8.82	7.14	0.89	379	80	248	769	475	237
2-17	8.58	6.52	0.90	368	55	207	740	485	206
2-24	9.39	7.21	0.98	388	64	221	712	458	229
3-3	8.94	7.23	0.89	387	71	215	792	508	219
3-10	8.67	6.92	1.09	374	83	189	770	410	206
3-17	8.54	7.16	0.92	370	94	181	756	502	188
—	—	—	—	—	—	—	—	—	—
3-24	8.54	6.75	1.04	614	80	380	921	512	273
3-31	8.87	7.07	1.01	616	89	379	935	552	277
4-7	8.79	7.20	0.98	626	99	392	940	545	288
4-14	8.38	7.24	0.92	610	78	415	908	605	275
4-21	8.22	7.24	0.87	612	64	376	898	582	261
—	—	—	—	—	—	—	—	—	—
5-12	8.67	7.56	0.82	866	130	660	1098	699	425
5-19	8.52	6.98	0.82	904	126	629	1100	640	374
5-26	9.04	7.84	0.89	911	111	708	1129	682	411
6-2	8.93	7.74	0.88	918	114	649	1118	632	377

\*\*\* Collection of samples suspended to allow laboratory staff to "catch up" with analyses. Regular diet procedure was maintained.



PAT

FIGURE 756. Actual size reproduction of roentgenogram of hand.  
Chronological age 61 months.



PAT

FIGURE 757. Actual size reproduction of roentgenogram of hand.  
Chronological age 66 months.



MEASUREMENTS OF THE BONES OF THE WRIST

Age, months	61	66	Age, months	61	66
Carpals			Carpals		
Area, sq. mm.			Greatest diameter, mm.		
Hamate	57	60	Hamate	10	11
Capitate	92	97	Capitate	13	14
Lesser Multangular	8	19	Lesser Multangular	4	5
Greater Multangular	4	6	Greater Multangular	2	3
Navicular	0	4	Navicular	0	2
Lunate	28	30	Lunate	6	7
Triangular	19	23	Triangular	5	6
Ulna			Epiphyses		
Diameter, mm.			1st Metacarpal	6	7
Distal epiphysis	0	0	2nd Metacarpal	7	7
Distal metaphysis	12	12	3rd Metacarpal	8	8
Radius			4th Metacarpal	7	7
Diameter, mm.			Wrist area,* sq. mm.	916	980
Distal epiphysis	17	17			

\* Measured with the planimeter using Flory's landmarks (Monographs of the Society for Research in Child Development Vol. I, No. 3, 1936).

TABLE 510

Pat  
61 months

AVERAGE DAILY INTAKE OF FOODS NOT INCLUDED  
IN BASAL DIET

Values in grams per day

Date	Milk solids	Butter	Bread	Sugar	Jelly	Corn starch	Water
10-14	21	24	45	24	60	4	671
10-28	21	29	34	40	54	6	693
11-4	21	28	46	32	57	4	686
11-25	21	28	44	33	30	7	564
12-2	21	32	50	28	57	6	543
12-9	21	25	60	42	25	7	586
12-16	21	27	26	27	24	6	757
1-13	21	31	71	22	37	6	721
1-20	21	32	81	19	37	6	871
1-27	21	32	66	19	43	6	714
2-3	21	32	78	19	43	6	736
2-10	21	32	63	18	43	6	828
2-17	21	32	58	18	43	7	828
2-24	21	32	60	12	43	7	913
3-3	21	32	71	16	43	7	800
3-10	21	32	61	21	43	7	771
3-17	21	32	63	21	43	8	771
3-24	42	32	37	38	16	8	721
3-31	42	32	57	21	43	8	750
4-7	42	32	60	21	43	6	714
4-14	42	32	50	21	30	8	743
4-21	42	29	37	21	12	8	654
4-28	63	22	35	21	28	8	757
5-5	63	26	61	21	14	7	721
5-12	63	25	51	21	28	7	828
5-19	60	25	40	21	12	7	686

TABLE 511

## BODY WEIGHT

Pat  
61 months

Date	kg.	Date	kg.	Date	kg.
11-17	17.69	1-20	16.33	3-31	17.69
11-24	17.69	1-27	16.56	4-7	17.46
12-1	18.03	2-3	17.24	4-14	17.69
		2-10	16.56		
12-8	18.14	2-17	17.69	4-21	17.69
12-15	18.37			4-28	17.69
12-22	17.24	2-24	17.01	5-5	17.69
		3-3	17.24		
12-29	18.37	3-10	16.78	5-12	17.69
1-6	17.01	3-17	18.14	5-19	18.14
1-13	16.78	3-24	17.46	5-26	18.14

TABLE 512

## URINE CREATININE PER 24 HOURS

Pat  
61 months

Date	mg.	Date	mg.	Date	mg.	Date	mg.
10-14	254	11-8	370	11-30	306	12-22	337
10-15	337	11-9	376	12-1	352	—	—
10-16	374	11-10	345	12-2	288	1-13	294
10-17	305	11-11	300	12-3	318	1-14	376
10-18	354	11-12	315	12-4	379	1-15	374
10-19	319	11-13	362	12-5	416	1-16	416
10-20	314	11-14	356	12-6	390	1-17	413
10-21	294	11-15	422	12-7	362	1-18	352
10-22	284	11-16	326	12-8	364	1-19	369
10-24	362	11-17	311	12-9	286	1-20	324
10-25	349	11-18	296	12-10	319	1-22	386
10-26	400	11-19	280	12-11	376	1-23	360
10-27	334	11-20	354	12-12	374	1-24	442
10-28	284	11-21	322	12-13	395	1-25	379
10-29	307	11-22	423	12-14	375	1-26	370
10-30	318	11-23	323	12-15	344	1-27	315
10-31	318	11-24	380	12-16	292	1-28	349
11-1	400	11-25	284	12-17	316	1-29	418
11-2	350	11-26	334	12-18	315	1-30	398
11-4	288	11-27	384	12-19	302	1-31	441
11-6	349	11-28	400	12-20	344	2-1	372
11-7	340	11-29	439	12-21	330	2-2	401

TABLE 513

Pat  
61 monthsNITROGEN, CALCIUM, PHOSPHORUS IN INTAKE,  
URINE, FECES*Values are averages per day*

Date	NITROGEN			CALCIUM			PHOSPHORUS		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.
10-14	8.36	6.76	1.08	1804	108	1596	1881	728	1216
—	—	—	—	—	—	—	—	—	—
10-28	8.08	6.81	0.94	1816	87	1531	1875	704	1101
11-4	8.36	7.06	1.04	1825	93	1525	1905	696	1218
—	—	—	—	—	—	—	—	—	—
11-25	8.59	6.99	1.03	1811	93	1585	1886	682	1152
12-2	8.48	7.04	1.10	1820	99	1535	1876	717	1076
12-9	8.34	6.43	0.98	1815	90	1640	1979	660	1179
12-16	7.78	6.77	1.14	1799	77	1618	1858	714	1187
***	—	—	—	—	—	—	—	—	—
1-13	—	—	—	1832	103	1586	1921	694	1066
1-20	—	—	—	1827	101	1668	1919	644	1177
1-27	8.31	7.34	0.88	372	105	230	771	502	164
2-3	8.39	7.20	0.86	375	111	202	786	468	221
2-10	8.52	7.12	0.97	368	89	213	746	460	233
2-17	8.46	6.66	0.88	363	74	210	729	451	235
2-24	8.82	7.40	0.92	370	88	207	670	458	234
3-3	8.74	7.21	0.83	380	88	207	776	466	238
3-10	8.60	7.31	0.85	371	94	178	765	441	218
3-17	8.56	7.45	0.80	370	93	182	758	440	216
3-24	8.44	7.26	0.90	610	92	348	914	538	278
3-31	9.03	7.59	0.90	620	121	380	949	482	302
4-7	8.90	7.75	0.83	628	110	392	947	545	298
4-14	8.60	7.23	0.90	616	104	402	926	575	287
4-21	8.27	7.77	0.76	613	86	340	902	540	251
4-28	9.26	7.78	0.86	870	99	656	1111	599	410
5-5	8.84	7.36	0.95	876	99	585	1134	619	362
5-12	8.58	7.38	0.87	860	111	647	1092	624	401
5-19	8.40	7.49	0.77	895	133	554	1089	711	360

\*\*\* Collection of samples suspended to allow laboratory staff to "catch up" with analyses. Regular diet procedure was maintained.



PEGGY

FIGURE 758. Actual size reproduction of roentgenogram of hand.  
Chronological age 63 months.



## PEGGY

FIGURE 759. Actual size reproduction of roentgenogram of hand.  
Chronological age 69 months.



TABLE 514

Peggy

MEASUREMENTS OF THE BONES OF THE WRIST

Age, months	63	69	Age, months	63	69
Carpals			Carpals		
Area, sq. mm.			Greatest diameter, mm.		
Hamate	60	61	Hamate	10	10
Capitate	92	94	Capitate	12	13
Greater Multangular	6	13	Greater Multangular	3	4
Navicular	0	7	Navicular	0	2
Lunate	25	27	Lunate	5	6
Triangular	25	31	Triangular	7	7
Ulna			Epiphyses		
Diameter, mm.			1st Metacarpal	6	6
Distal epiphysis	0	0	2nd Metacarpal	7	7
Distal metaphysis	13	13	3rd Metacarpal	7	8
Radius			4th Metacarpal	6	7
Diameter, mm.					
Distal epiphysis	14	15	Wrist area,* sq. mm.	767	815

\* Measured with the planimeter using Flory's landmarks (Monographs of the Society for Research in Child Development Vol. I, No. 3, 1936).

TABLE 515

Peggy  
63 months

AVERAGE DAILY INTAKE OF FOODS NOT INCLUDED  
IN BASAL DIET

Values in grams per day

Date	Milk solids	Butter	Bread	Sugar	Jelly	Corn starch	Water
10-14	21	25	65	24	60	4	786
10-21	21	25	91	28	75	3	857
10-28	21	32	88	40	114	6	714
11-4	21	32	113	31	114	4	614
11-11	21	23	86	10	91	5	714
11-25	21	37	66	34	57	7	528
12-2	21	39	91	29	57	7	536
12-9	21	32	61	42	51	7	614
12-16	21	32	57	27	57	6	671
1-13	21	32	104	22	57	6	743
1-20	21	32	88	20	57	6	800
1-27	21	32	76	20	57	6	743
2-3	21	32	84	20	57	6	771
2-10	21	32	90	19	57	6	743
2-17	21	32	67	18	57	7	714
2-24	21	32	94	13	57	7	800
3-3	21	32	96	16	57	7	757
3-10	21	32	98	19	57	7	786
3-17	21	35	97	21	68	8	814
3-24	42	30	76	38	71	8	743
3-31	42	39	98	21	71	8	725
4-7	42	36	80	21	71	6	728
4-14	42	36	86	21	71	8	807
4-21	42	36	86	21	71	8	718
4-28	63	29	64	21	71	7	725
5-5	63	36	66	21	57	7	714
5-12	63	36	78	21	57	6	771
5-19	60	36	77	21	57	7	771

TABLE 516

Peggy  
63 months

## BODY WEIGHT

Date	kg.	Date	kg.	Date	kg.
11-17	19.05	1-20	18.14	3-24	18.37
11-24	19.50	1-27	18.14	3-31	18.60
12-1	19.50	2-3	18.14	4-7	18.82
12-8	19.96	2-10	18.14	4-14	18.82
12-15	19.73	2-17	18.14	4-21	19.28
12-22	19.28	2-24	18.14	4-28	19.05
				5-5	18.82
12-29	19.73	3-3	18.60	5-12	19.05
1-6	18.14	3-10	17.92	5-19	19.96
1-13	18.14	3-17	18.60	5-26	19.05

TABLE 517

Peggy  
63 months

## URINE CREATININE PER 24 HOURS

Date	mg.	Date	mg.	Date	mg.	Date	mg.
10-14	320	11-6	394	11-29	532	12-22	386
10-15	379	11-7	394	11-30	390	—	—
10-16	376	11-8	430	12-1	448	1-13	319
10-17	357	11-9	447	12-2	333	1-14	406
10-18	397	11-10	398	12-3	376	1-15	429
10-19	330	11-11	376	12-4	441	1-16	468
10-20	380	11-12	374	12-5	432	1-17	480
10-21	349	11-13	426	12-6	490	1-18	447
10-22	362	11-14	400	12-7	425	1-19	360
10-23	398	11-15	480	12-8	422	1-20	364
10-24	385	11-16	420	12-9	360	1-21	448
10-25	376	11-17	370	12-10	368	1-22	445
10-26	344	11-18	365	12-11	424	1-23	427
10-27	352	11-19	360	12-12	428	1-24	524
10-28	328	11-20	425	12-13	498	1-25	459
10-29	368	11-21	390	12-14	432	1-26	452
10-30	395	11-22	518	12-15	425	1-27	354
10-31	376	11-23	400	12-16	360	1-28	420
11-1	458	11-24	494	12-17	396	1-29	444
11-2	391	11-25	343	12-18	424	1-30	483
11-3	422	11-26	395	12-19	388	1-31	525
11-4	323	11-27	415	12-20	460	2-1	446
11-5	343	11-28	411	12-21	394	2-2	438

TABLE 518

Peggy  
63 monthsNITROGEN, CALCIUM, PHOSPHORUS IN INTAKE,  
URINE, FECES*Values are averages per day*

Date	NITROGEN			CALCIUM			PHOSPHORUS		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.
10-14	8.72	6.56	1.46	1812	90	1688	1906	508	1311
10-21	9.29	7.10	1.38	1849	77	1707	1971	554	1388
10-28	8.94	6.66	1.58	1850	84	1764	1955	492	1420
11-4	9.40	7.25	1.55	1859	100	1647	2000	552	1355
11-11*	9.29	7.46	1.31	1831	64	1630	1954	553	1402
—	—	—	—	—	—	—	—	—	—
11-25	8.98	7.19	1.11	1826	56	1504	1920	501	1279
12-2	9.12	7.42	1.30	1846	75	1742	1937	529	1395
12-9	8.24	7.12	1.42	1816	54	1818	1975	498	1433
12-16	8.31	7.22	1.08	1816	43	1624	1894	553	1304
†††	—	—	—	—	—	—	—	—	—
1-13	—	—	—	1841	64	1577	1961	557	1233
1-20	—	—	—	1833	67	1850	1930	557	1390
1-27	8.46	7.62	0.89	379	52	308	787	465	299
2-3	8.48	7.69	0.88	379	58	244	794	470	259
2-10	8.96	7.65	0.85	383	61	227	780	470	238
2-17	8.58	6.75	0.76	368	59	227	741	473	247
2-24	9.42	7.54	0.88	389	50	237	714	455	250
3-3	9.14	8.12	0.89	393	81	263	811	492	277
3-10	9.22	7.77	0.87	391	73	227	817	446	250
3-17	9.13	7.81	0.83	390	65	231	804	415	250
3-24	9.10	7.72	1.03	636	64	443	967	493	353
3-31	9.70	7.41	1.10	643	73	428	999	518	340
4-7	9.22	7.83	0.94	641	70	467	975	543	340
4-14	9.20	7.25	1.29	638	48	463	965	550	353
4-21	9.00	7.66	1.23	642	51	473	971	567	344
4-28	9.93	8.09	1.09	890	71	731	1168	567	501
5-5	8.90	7.79	0.97	882	65	720	1141	605	468
5-12	9.00	7.41	0.94	878	72	716	1129	597	457
5-19	9.02	7.86	1.08	918	87	732	1140	739	407

\* Four-day period.

††† Collection of samples suspended to allow laboratory staff to "catch up" with analyses. Regular diet procedure was maintained.

TABLE 519

AVERAGE DAILY INTAKE OF FOODS IN BASAL DIETARY  
BY BIRCH, JOE, CLARENCE, DEWAYNE, GEORGE,  
STEVE, ORVILLE

*Values in grams per day*

FOOD*	DATE							
	10-20	12-8	6-29	7-13	8-31	9-28	11-16	11-30
	to 12-7	to 6-28	to 7-12	to 8-30	to 9-27	to 11-15	to 11-29	to 12-14
Apple	0	0	0	0	0	14	14	14
Apple sauce	36	36	36	36	36	36	36	36
Apricots	3	3	3	3	3	3	3	3
Ascorbic acid	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Banana	27	27	30	30	30	30	30	30
Beans, green	7	7	7	7	7	7	7	7
Beef, ground	34	34	34	34	34	34	34	34
Cabbage	7	7	7	7	7	7	7	7
Carrot	4	4	6	6	6	6	6	6
Chicken	8	0	0	0	0	0	0	0
Cod liver oil	5	5	5	5	5	5	5	5
Di-calciumphosphate	0	0	0	0.5	0	0	0	0
Egg white	34	34	34	34	34	34	34	34
Egg yolk	16	16	16	16	16	16	16	16
Farina	3	3	3	3	3	4	4	4
Ferric chloride	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22
Fruit juice, mixed	23	23	23	23	23	23	23	23
Gelatin	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Grapefruit	11	11	11	11	11	11	11	11
Grapefruit juice	3	3	3	3	3	3	3	3
Lemon juice	6	6	6	6	6	6	6	6
Lettuce	1	1	3	3	3	3	3	3
Liver, beef	8	8	8	8	8	8	8	8
Macaroni	2	2	2	2	2	2	2	2
Marshmallow	4	4	4	4	4	4	4	4
Oatmeal	4	4	4	4	4	4	4	4
Peach	14	14	21	21	21	21	21	21
Pear	25	25	43	43	43	43	43	54
Pear juice	3	3	3	3	3	3	3	3
Pineapple	11	11	11	11	11	11	11	11
Pineapple juice	1	1	16	16	16	16	16	16
Potato, Irish	86	86	100	100	100	150	150	150
Potato, Sweet	11	11	11	11	11	11	11	11
Prunes	9	9	9	9	9	9	9	9
Rice	6	6	6	6	6	11	11	11
Spaghetti	4	4	4	4	4	4	4	4
Tapioca	1	1	1	1	1	1	1	1
Tomato juice	46	46	46	46	46	46	46	46
Tuna fish	8	17	17	17	17	17	17	17
Watermelon	0	0	14	14	14	0	0	0

\* Not all of the foods were given every day in the periods. Seven diets, one for each day of the week, were repeated during each seven-day period. The averages given are one-seventh of the total intake of a food during each period.

TABLE 520

George  
62 monthsAVERAGE DAILY INTAKE OF FOODS NOT INCLUDED  
IN BASAL DIET*Values in grams per day*

Date	Casein	Yeast	Milk solids	Butter	Bread	Sugar	Jelly	Corn starch	Water
10-20	—	1	114	27	43	14	48	3	714
10-27	—	1	114	27	43	14	71	4	943
11-3	—	1	114	35	61	17	57	6	700
11-10	—	1	114	36	61	18	64	6	721
11-17	—	1	114	42	60	18	71	6	600
11-24	—	1	114	43	64	18	77	6	721
12-1	—	1	114	42	51	18	82	3	771
12-8	—	1	114	42	33	18	46	3	843
12-15	—	1	114	43	56	18	51	4	686
12-22	—	1	114	43	60	23	63	4	743
12-29	—	1	114	42	64	18	66	4	743
1-5	—	1	114	36	43	18	56	4	743
1-12	—	1	114	32	28	18	41	4	828
1-19	10	1	17	35	37	18	46	3	786
1-26	10	1	17	34	57	18	56	3	900
2-2	10	1	17	34	63	18	70	3	807
2-9	10	1	17	44	84	21	83	3	928
2-16	10	1	17	36	93	21	70	3	1021
2-23	10	1	17	32	80	21	70	3	1011
3-2	10	1	17	40	90	21	70	3	986
3-9	10	1	33	43	103	21	71	3	871
3-16	10	1	33	41	126	21	85	3	1071
3-23	10	1	33	43	113	21	92	3	1128
3-30	10	1	33	42	110	21	71	3	893
4-6	10	1	33	29	67	21	71	3	1028
4-13	10	1	44	36	100	27	99	3	986
4-20	10	1	44	37	97	21	85	3	1000
4-27	10	1	44	36	94	21	70	3	957
5-4	10	1	44	34	90	21	89	3	971
5-11	10	1	59	33	110	21	99	3	1043
5-18	10	1	59	38	106	21	85	3	1043
6-8	10	1	59	29	90	31	70	3	1021
6-15	10	1	59	25	80	28	70	3	1028
6-22	10	1	59	29	91	28	69	3	1014
6-29	10	1	59	36	118	28	71	3	971
7-6	10	1	59	20	67	28	71	3	971
7-13	10	2	17	80	107	28	70	3	1000
7-20	10	2	17	34	100	28	70	3	971
7-27	10	2	17	35	118	28	70	3	1014
8-3	10	2	17	36	144	28	86	3	1071
8-10	10	2	17	49	136	28	84	3	971
8-17	10	2	17	60	143	47	94	3	1043
8-24	10	2	17	57	133	43	99	3	1043



TABLE 521

George  
62 months

## BODY WEIGHT

Date	kg.	Date	kg.	Date	kg.
10-20	19.62	2-9	20.75	6-1	20.41
10-27	19.56	2-16	20.41	6-8	20.64
11-3	19.73	2-23	20.24	6-15	20.58
11-10	19.90	3-2	19.96	6-22	20.58
11-17	20.24	3-9	19.84	6-29	20.81
11-24	20.47	3-16	20.35	7-6	20.75
12-1	20.24	3-23	20.52	7-13	20.64
12-8	20.41	3-30	20.64	7-20	20.58
12-15	20.41	4-6	20.64	7-27	20.64
12-22	20.36	4-13	20.47	8-3	20.52
12-29	20.47	4-20	20.47	8-10	20.58
1-5	20.86	4-27	20.58	8-17	20.75
1-12	20.70	5-4	20.47	8-24	21.20
1-19	20.64	5-11	20.64	8-31	21.20
1-26	20.30	5-18	20.81	9-7	20.98
2-2	20.13	5-25	20.86		

TABLE 522

George

## ANTHROPOMETRIC MEASUREMENTS

*Values in centimeters*

AGE, months	63	66	70
HEIGHT,			
Horizontal	113.2	115.2	117.4
Suprasternal	89.0	90.7	92.6
Symphysis pubis	55.4	55.8	56.5
Tip of acromion	90.4	94.6	95.2
Cristal	66.0	66.4	68.2
Trochanter	55.4	55.8	57.2
Knee	28.0	29.4	30.3
Sitting	61.5	62.2	63.5
BREADTH,			
Acromial	21.4	21.8	22.0
Chest	—	19.4	19.8
Cristal	16.5	17.7	17.9
Trochanteric	17.8	19.5	20.3
LENGTH,			
Entire arm	37.9	38.5	39.0
Upper arm	21.8	22.4	22.2
Forearm	16.2	16.5	16.6
Hand	12.4	13.2	13.2
Tibial	23.5	25.0	26.1
GIRTH,			
Chest (ensiform)	56.5	57.2	58.4
Upper arm	17.5	16.2	16.4
Calf	21.2	21.6	21.6
Cristal	55.9	56.5	58.2

TABLE 523

George  
62 months

## NITROGEN, CALCIUM, PHOSPHORUS IN INTAKE, URINE, FECES

*Values are averages per day*

Date	NITROGEN			CALCIUM			PHOSPHORUS		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.
10-20	—	—	—	1602	50	1465	—	—	—
10-27	—	—	—	1598	34	1044	—	—	—
11-3	11.32	10.62	0.67	1612	36	1657	1674	756	790
11-10	11.54	12.12	0.63	1618	49	1213	1646	886	706
11-17	11.70	12.90	0.52	1614	40	935	1622	891	513
11-24	11.70	11.22	1.11	1623	43	1773	1671	804	1102
12-1	11.44	11.33	1.13	1615	55	1447	1632	811	821
12-8	11.21	10.94	0.96	1604	47	1429	1637	843	830
12-15	11.42	11.50	0.99	1614	60	1509	1688	823	1056
12-22	11.54	11.92	1.00	1617	52	1371	1644	894	820
12-29	11.55	11.01	1.33	1626	64	1773	1657	832	961
1-5	11.16	10.52	0.94	1608	40	1300	1615	839	636
1-12	10.80	10.34	1.12	1628	42	1526	1597	792	799
1-19	7.23	7.89	0.59	326	34	365	718	558	359
1-26	7.13	7.24	0.63	331	31	310	683	460	289
2-2	7.72	6.75	0.59	336	16	201	741	400	216
2-9	7.96	6.27	0.90	352	12	315	864	418	295
2-16	7.89	7.50	0.78	345	10	233	784	510	280
2-23	7.75	7.52	0.76	340	21	327	781	476	520
3-2	8.03	7.30	0.65	353	11	255	786	466	256
3-9	8.73	8.25	0.72	558	20	447	915	530	332
3-16	9.70	8.35	0.79	580	13	473	1013	597	350
3-23	9.31	8.65	0.68	574	16	527	1001	588	409
3-30	9.13	8.78	0.58	562	15	360	962	595	303
4-6	8.56	8.46	0.68	558	19	529	906	570	438
4-13	9.51	8.43	0.63	717	20	549	1044	545	634
4-20	9.64	8.61	0.85	725	22	693	1067	612	470
4-27	9.76	9.19	0.63	716	16	542	1081	603	397
5-4	9.73	9.16	0.71	712	16	628	1055	628	455
5-11	10.80	9.71	0.84	925	20	801	1192	664	546
5-18	10.50	9.45	1.00	924	31	677	1242	663	479
—	—	—	—	—	—	—	—	—	—
6-8	—	—	—	917	29	834	1187	692	522
6-15	—	—	—	900	21	770	1182	644	491
6-22	—	—	—	901	28	838	1196	698	619
6-29	—	—	—	933	25	742	—	690	501
7-6	—	—	—	906	22	680	—	692	505
7-13	—	—	—	493	29	470	—	608	396
7-20	—	—	—	498	21	409	—	516	373
7-27	—	—	—	516	30	383	—	522	336
8-3	9.18	7.87	0.85	539	31	465	—	534	361
8-10	8.58	7.17	0.81	520	34	392	—	544	330
8-17	8.92	6.87	0.86	529	35	371	—	475	321
8-24	8.75	6.94	1.02	501	36	374	—	507	339

TABLE 524

Joe  
68 monthsAVERAGE DAILY INTAKE OF FOODS NOT INCLUDED  
IN BASAL DIET*Values in grams per day*

Date	Casein	Yeast	Milk solids	Butter	Bread	Sugar	Jelly	Corn starch	Water
10-27	—	1	114	23	18	14	42	4	857
11-3	—	1	114	35	48	17	49	6	721
11-10	—	1	114	36	56	18	56	6	736
11-17	—	1	114	35	54	18	67	6	671
11-24	—	1	114	42	31	18	48	6	636
12-1	—	1	114	34	23	18	45	3	714
12-8	—	1	114	35	13	18	38	3	732
12-15	—	1	114	27	13	18	21	4	700
12-22	—	1	114	23	9	23	15	4	743
12-29	—	1	114	21	8	18	6	4	714
1-5	—	1	114	13	14	18	12	4	728
1-12	—	1	114	25	16	18	26	4	814
1-19	10	1	17	28	53	18	67	3	957
1-26	10	1	17	33	64	18	63	3	943
2-2	10	1	17	36	86	18	97	3	843
2-9	10	1	17	39	77	21	97	3	1000
2-16	10	1	17	38	90	21	71	3	857
2-23	10	1	17	28	64	21	60	3	1011
3-2	10	1	17	42	91	21	70	3	1014
3-9	10	1	33	43	87	21	70	3	928
3-16	10	1	33	35	71	21	60	3	1071
3-23	10	1	33	23	50	21	70	3	1114
3-30	10	1	33	32	53	21	65	3	900
4-6	10	1	33	26	48	21	60	3	1071
4-13	10	1	44	17	48	27	59	3	1028
4-20	10	1	44	26	56	21	62	3	1000
4-27	10	1	44	24	67	21	67	3	871
5-4	10	1	44	25	71	21	67	3	957
5-11	10	1	59	30	80	21	85	3	1028
—	10	1	59	27	77	21	81	3	1086
5-18	—	—	—	—	—	—	—	—	—
6-8	10	1	59	27	81	31	71	3	1028
6-15	10	1	59	25	96	28	70	3	1043
6-22	10	1	59	27	111	28	70	3	1014
6-29	10	1	59	36	71	28	71	3	993
7-6	10	1	59	16	50	28	49	3	914
7-13	10	2	17	30	68	28	70	3	1000
7-20	10	2	17	18	74	28	70	3	1000
7-27	10	2	17	26	70	28	73	3	1000
8-3	10	2	17	32	96	28	71	3	1071
8-10	10	2	17	46	86	28	69	3	957
8-17	10	2	17	40	74	47	63	3	1143
8-24	10	2	17	46	96	43	84	3	1071
—	—	—	—	—	—	—	—	—	—
9-7	10	2	17	38	53	46	49	3	928
9-14	10	2	17	47	57	43	70	3	928
9-21	10	2	17	29	50	47	52	3	928
9-28	10	2	17	36	54	47	62	3	943
10-5	10	2	17	45	67	33	71	3	971
10-12	10	2	17	36	61	43	71	3	928
10-19	10	2	17	39	68	43	70	3	1028
10-26	10	2	17	38	63	43	69	3	1000
11-2	10	2	17	36	61	43	69	3	1014
11-9	10	2	17	37	64	43	56	3	857
11-16	10	2	17	41	66	43	70	3	886
11-23	10	2	17	32	60	47	65	3	857
11-30	10	2	17	30	60	43	57	3	714
12-7	10	2	17	22	60	45	56	3	928

TABLE 525

Joe  
68 months

## BODY WEIGHT

Date	kg.	Date	kg.	Date	kg.
10-20	19.56	3-9	19.79	7-27	20.52
10-27	19.05	3-16	20.18	8-3	20.52
11-3	19.39	3-23	20.18	8-10	20.64
11-10	19.50	3-30	20.24	8-17	20.75
11-17	19.84	4-6	20.18	8-24	21.09
11-24	20.01	4-13	20.07	8-31	21.15
12-1	20.30	4-20	19.84	9-7	21.09
12-8	20.30	4-27	19.96	9-14	21.15
12-15	20.18	5-4	20.07	9-21	21.20
12-22	19.96	5-11	20.13	9-28	21.38
12-29	20.07	5-18	20.30	10-5	21.49
1-5	20.07	5-25	20.47	10-12	21.60
1-12	19.96	6-1	20.18	10-19	22.00
1-19	20.07	6-8	20.41	10-26	22.11
1-26	19.84	6-15	20.41	11-2	22.11
2-2	19.84	6-22	20.58	11-9	22.11
2-9	20.07	6-29	20.86	11-16	22.11
2-16	20.13	7-6	20.67	11-23	22.17
2-23	20.24	7-13	20.70	11-30	22.40
3-2	19.84	7-20	20.52	12-7	22.40

TABLE 526

Joe

## ANTHROPOMETRIC MEASUREMENTS

*Values in centimeters*

AGE, months	69	72	76	85
HEIGHT,				
Horizontal	115.6	117.2	119.8	124.1
Suprasternal	91.8	92.8	95.1	99.0
Symphysis pubis	56.6	58.2	59.2	—
Tip of acromion	95.6	97.6	99.7	102.1
Cristal	67.5	70.0	71.8	73.4
Trochanter	57.4	58.5	59.8	62.6
Knee	30.0	29.8	31.8	32.8
Sitting	62.9	64.4	64.2	65.7
BREADTH,				
Acromial	21.8	22.1	22.6	26.4
Chest	—	19.4	19.2	19.7
Cristal	16.9	16.8	17.6	19.6
Trochanteric	19.6	19.7	20.3	—
LENGTH,				
Entire arm	37.8	38.2	39.1	40.6
Upper arm	22.2	22.9	23.4	23.5
Forearm	15.0	15.8	16.2	17.4
Hand	12.3	13.0	13.0	13.2
Tibial	24.9	24.6	26.5	27.7
GIRTH,				
Chest (ensiform)	55.2	55.1	56.8	57.5
Upper arm	16.1	15.9	16.5	15.8
Calf	24.3	23.5	23.8	23.4
Cristal	51.8	51.3	57.2	55.8

TABLE 527

Joe  
68 months

## NITROGEN, CALCIUM, PHOSPHORUS IN INTAKE, URINE, FECES

*Values are averages per day*

Date	NITROGEN			CALCIUM			PHOSPHORUS		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.
10-27	—	—	—	1575	132	1126	—	—	—
11-3	11.10	10.61	1.08	1601	198	1192	1652	953	618
11-10	11.45	11.16	0.99	1613	236	1092	1635	983	591
11-17	11.60	12.19	1.06	1604	271	1308	1607	1011	641
11-24	11.17	11.55	1.02	1597	291	1234	1622	1001	672
12-1	10.99	11.10	1.07	1595	260	1301	1589	939	698
12-8	10.88	10.84	0.89	1588	239	1210	1604	966	649
12-15	10.77	10.95	0.75	1585	216	1312	1623	939	692
12-22	10.76	10.80	0.85	1590	202	1309	1573	899	700
12-29	10.75	10.12	0.83	1591	213	1166	1579	893	556
1-5	10.73	10.92	0.94	1585	192	1282	1566	894	716
1-12	10.60	9.92	0.86	1619	185	1262	1577	859	703
1-19	7.21	7.43	0.71	333	142	274	738	587	253
1-26	7.46	6.99	0.59	333	113	180	691	522	226
2-2	8.07	6.75	0.72	347	96	190	769	515	205
2-9	7.86	6.56	0.87	349	98	208	868	525	244
2-16	7.86	7.20	0.78	343	94	172	778	580	211
2-23	7.51	7.19	0.71	334	76	210	760	525	227
3-2	8.05	7.22	0.63	352	99	161	788	535	195
3-9	8.40	7.93	0.66	552	119	284	894	570	256
3-16	8.81	7.70	0.62	550	95	369	921	565	280
3-23	8.29	7.33	0.68	541	74	312	904	552	261
3-30	8.30	8.12	0.65	535	95	336	886	618	278
4-6	8.26	7.90	0.68	545	116	328	876	618	266
4-13	8.72	8.02	0.83	689	101	526	970	674	383
4-20	8.87	8.44	0.72	700	113	457	1000	613	304
4-27	9.26	8.49	0.67	701	110	453	1043	608	367
5-4	9.40	8.89	0.69	697	121	468	1020	650	377
5-11	10.31	9.21	0.70	909	144	569	1151	739	384
5-18	10.06	9.49	0.79	910	158	598	1203	739	375
6-8	—	—	—	914	154	659	1174	784	412
6-15	—	—	—	900	158	636	1191	830	426
6-22	—	—	—	909	170	628	1225	760	482
6-29	—	—	—	907	148	646	1203	780	463
7-6	—	—	—	894	119	589	1156	770	425
7-13	—	—	—	478	97	340	794	618	204
7-20	—	—	—	483	94	313	850	634	282
7-27	—	—	—	489	123	302	818	560	265
8-3	8.25	7.14	0.66	512	167	268	840	572	220
8-10	7.80	6.62	0.88	493	139	308	843	528	274
8-17	7.77	6.40	0.77	490	126	294	802	520	262
8-24	8.17	6.70	0.74	484	151	265	806	542	228
8-31	—	—	—	—	—	—	—	—	—
9-7	7.64	6.43	0.68	346	141	195	700	538	163
9-14	7.41	6.55	0.73	351	153	210	630	516	201
9-21	7.38	6.45	0.68	350	161	183	699	516	182
9-28	8.40	6.30	0.77	356	148	174	768	479	189
10-5	7.77	6.08	0.91	363	158	189	755	493	209
10-12	7.65	6.38	0.86	360	125	192	709	514	204
10-19	8.16	6.33	0.77	375	160	175	723	528	161
10-26	8.07	6.59	0.74	355	122	163	—	509	169
11-2	7.56	6.26	0.89	348	138	178	—	488	187
11-9	7.86	7.18	0.83	348	121	164	—	544	187
11-16	7.87	6.55	0.71	342	142	136	—	503	168
11-23	—	6.63	0.84	340	142	175	—	503	182
11-30	7.56	6.54	0.85	343	129	157	—	536	217



TABLE 528

DeWayne  
60 monthsAVERAGE DAILY INTAKE OF FOODS NOT INCLUDED  
IN BASAL DIET*Values in grams per day*

Date	Casein	Yeast	Milk solids	Butter	Bread	Sugar	Jelly	Corn starch	Water
2-2	—	1	114	9	3	18	5	3	786
2-9	—	1	114	20	20	21	21	3	943
2-16	—	1	114	14	18	21	16	3	643
—	—	—	—	—	—	—	—	—	—
3-23	—	1	114	17	24	21	28	3	1114
3-30	—	1	114	15	16	21	18	3	843
4-6	—	1	114	12	17	21	17	3	1000
4-13	10	1	44	13	37	27	35	3	857
4-20	10	1	44	14	41	21	38	3	1000
4-27	10	1	44	12	28	21	32	3	871
5-4	10	1	44	16	34	21	47	3	857
5-11	10	1	59	13	30	21	42	3	1000
5-18	10	1	59	18	48	21	47	3	928
5-25	10	1	59	4	28	21	30	3	1014
—	—	—	—	—	—	—	—	—	—
6-8	10	1	114	14	36	31	25	3	971
6-15	—	1	114	13	43	28	43	3	1028
6-22	10	1	114	10	21	28	16	3	1014
6-29	10	1	59	15	17	28	21	3	1000
7-6	10	1	114	8	14	28	33	3	757
7-13	10	2	17	20	50	28	34	3	943
7-20	10	2	17	21	63	28	56	3	1000
7-27	10	2	17	21	47	28	45	3	986
8-3	10	2	17	25	73	28	85	3	1043
8-10	10	2	17	40	81	28	70	3	843
8-17	10	2	17	29	56	47	49	3	1028
8-24	10	2	17	35	56	43	64	3	1057
—	—	—	—	—	—	—	—	—	—
9-7	10	2	17	27	30	46	30	3	928
9-14	10	2	17	26	41	43	51	3	928
9-21	10	2	17	24	40	47	46	3	878
9-28	10	2	17	36	54	47	70	3	900
10-5	10	2	17	39	67	33	70	3	943
10-12	10	2	17	36	60	43	71	3	914
—	—	—	—	—	—	—	—	—	—
10-19	10	2	17	40	67	43	70	3	1014
10-26	10	2	17	30	58	43	59	3	1000
11-2	10	2	17	33	56	43	67	3	1014

TABLE 529

DeWayne  
60 months

BODY WEIGHT

Date	kg.	Date	kg.	Date	kg.
1-19	16.44	5-18	17.46	8-31	17.86
1-26	16.61	5-25	17.46	9-7	17.86
2-2	16.44	6-1	17.24	9-14	17.86
2-9	16.50	6-8	17.58	9-21	17.97
2-16	16.73	6-15	17.78	9-28	18.31
2-23	16.84	6-22	17.69	10-5	18.54
—	—	6-29	17.86	10-12	18.88
3-23	17.18	7-6	17.69	10-19	18.91
3-30	17.07	7-13	17.52	10-26	19.39
4-6	17.24	7-20	17.52	11-2	19.45
4-13	17.18	7-27	17.75	11-9	19.62
4-20	17.29	8-3	17.35	11-16	19.84
4-27	17.24	8-10	17.69	11-23	20.01
5-4	17.41	8-17	17.78	11-30	19.84
5-11	17.41	8-24	17.92	12-7	19.79

TABLE 530

DeWayne

ANTHROPOMETRIC MEASUREMENTS

*Values in centimeters*

AGE, months	60	65	73
HEIGHT,			
Horizontal	103.8	107.3	111.3
Suprasternal	81.6	85.6	88.1
Symphysis pubis	49.5	51.8	—
Tip of acromion	84.8	88.0	91.8
Cristal	60.6	61.4	64.8
Trochanter	50.0	53.4	51.3
Knee	26.7	28.4	29.1
Sitting	58.6	59.5	58.9
BREADTH,			
Acromial	20.0	20.2	24.7
Chest	17.1	18.1	18.0
Cristal	16.1	16.3	17.6
Trochanteric	17.3	17.2	19.0
LENGTH,			
Entire arm	34.0	34.4	36.5
Upper arm	20.5	20.6	21.1
Forearm	14.0	14.4	15.4
Hand	11.8	12.2	11.9
Tibial	22.6	23.6	23.4
GIRTH,			
Chest (ensiform)	52.3	54.7	54.6
Upper arm	15.9	15.9	17.1
Calf	21.0	21.3	21.6
Cristal	50.8	55.2	52.6

TABLE 531

DeWayne  
60 monthsNITROGEN, CALCIUM, PHOSPHORUS IN INTAKE, URINE, FECES  
*Values are averages per day*

Date	NITROGEN			CALCIUM			PHOSPHORUS		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.
2-2	10.74	8.59	1.22	1607	64	1290	1644	672	818
2-9	10.92	9.00	1.01	1609	80	1404	1713	685	674
2-16	10.66	9.37	1.00	1605	75	1346	1664	684	677
3-23	10.93	9.84	1.08	1614	58	1267	1688	787	748
3-30	10.82	9.38	1.19	1608	60	1203	1645	682	681
4-6	10.83	9.91	0.81	1623	65	1120	1658	717	724
4-13	10.99	10.41	1.23	1629	71	1442	1666	791	802
4-20	11.09	11.03	1.05	1619	54	1293	1679	878	725
4-27	11.01	10.65	1.06	1616	86	1273	1697	779	704
5-4	11.24	10.47	0.96	1610	94	1340	1680	794	807
5-11	11.11	10.10	1.28	1609	107	1468	1634	797	852
5-18	11.22	10.12	0.86	1622	141	1324	1722	815	765
5-25	11.29	11.05	1.04	1606	131	1441	1691	874	829
6-8	—	—	—	1612	127	1206	1663	856	829
6-15	—	—	—	1612	130	1368	1691	854	850
6-22	—	—	—	1595	114	1465	1677	732	—
6-29	—	—	—	1601	105	1291	1661	738	878
7-6	—	—	—	1607	86	1250	1672	802	791
7-13	—	—	—	464	79	587	781	572	520
7-20	—	—	—	481	77	343	852	469	330
7-27	—	—	—	472	92	397	786	507	226
8-3	7.81	6.41	0.87	503	102	344	816	479	303
8-10	7.74	6.27	1.16	496	98	366	842	473	346
8-17	7.46	6.44	0.66	478	86	312	783	467	250
8-24	7.56	6.25	1.09	469	92	377	776	473	386
9-7	7.22	6.45	0.66	334	79	238	673	451	237
9-14	7.13	6.62	0.49	339	102	217	610	453	223
9-21	7.24	6.41	0.80	344	103	262	688	453	277
9-28	8.34	6.10	0.63	357	111	198	769	417	211
10-5	7.77	6.12	0.86	364	107	222	752	433	255
10-12	7.63	6.16	1.04	362	96	225	705	419	255
10-19	8.13	6.04	1.01	373	98	223	716	445	224
10-26	7.99	6.56	0.76	352	82	204	—	473	218
11-2	7.46	5.26	1.38	345	77	192	—	354	252

TABLE 532

Orville  
44 monthsAVERAGE DAILY INTAKE OF FOODS NOT INCLUDED  
IN BASAL DIET*Values in grams per day*

Date	Casein	Yeast	Milk solids	Butter	Bread	Sugar	Jelly	Corn starch	Water
10-20	—	1	114	14	9	14	10	3	786
10-27	—	1	114	13	10	14	17	4	743
11-3	—	1	114	28	30	17	28	6	671
11-10	—	1	114	31	14	18	31	6	686
11-17	—	1	114	31	18	18	26	6	657
11-24	—	1	114	27	13	18	18	6	593
12-1	—	1	114	31	11	18	23	3	828
12-8	—	1	114	28	14	18	22	3	786
12-15	—	1	114	23	10	18	12	4	657
12-22	—	1	114	18	3	23	0	4	728
12-29	—	1	114	21	16	18	12	4	736
1-5	—	1	114	20	16	18	20	4	700
1-12	—	1	114	18	6	18	11	4	743
1-19	10	1	17	21	30	18	34	3	786
1-26	10	1	17	22	31	18	36	3	943
2-2	10	1	17	23	37	18	34	3	800
2-9	10	1	17	25	54	21	51	3	921
2-16	10	1	17	28	60	21	49	3	836
2-23	10	1	17	28	68	21	56	3	1011
3-2	10	1	17	35	68	21	56	3	986
3-9	10	1	33	40	77	21	55	3	864
3-16	10	1	33	26	61	21	38	3	1043
3-23	10	1	33	28	67	21	56	3	1114
3-30	10	1	33	17	66	21	55	3	843
4-6	10	1	33	21	61	21	56	3	993
4-13	10	1	44	20	57	27	56	3	986
4-20	10	1	44	16	73	21	57	3	971
4-27	10	1	44	29	80	21	56	3	928
5-4	10	1	44	25	77	21	72	3	871
5-11	10	1	59	28	74	21	76	3	1000
5-18	10	1	59	27	76	21	71	3	943
5-25	10	1	59	16	47	21	42	3	971
6-8	10	1	59	31	71	31	56	3	1028
6-15	10	1	59	21	80	28	56	3	1000
6-22	10	1	59	28	68	28	56	3	928
6-29	10	1	59	28	67	28	71	3	971
7-6	10	1	59	15	46	28	48	3	914
7-13	10	2	17	21	64	28	57	3	928
7-20	10	2	17	27	64	28	71	3	971
7-27	10	2	17	28	64	28	54	3	971
8-3	10	2	17	28	93	28	69	3	1071
8-10	10	2	17	42	91	28	70	3	843
8-17	10	2	17	38	88	47	69	3	1057
8-24	10	2	17	43	104	43	84	3	971
9-7	10	2	17	35	44	46	51	3	928
9-14	10	2	17	43	48	43	48	3	843
9-21	10	2	17	24	41	47	54	3	878
9-28	10	2	17	38	54	47	64	3	914
10-5	10	2	17	48	67	33	68	3	943
10-12	10	2	17	41	66	43	71	3	914
10-19	10	2	17	42	73	43	70	3	1028
10-26	10	2	17	37	60	43	70	3	1000

TABLE 533

Orville  
44 months

BODY WEIGHT

Date	kg.	Date	kg.	Date	kg.
10-20	15.88	3-9	16.67	7-27	17.80
10-27	15.82	3-16	16.78	8-3	18.03
11-3	15.88	3-23	17.07	8-10	18.03
11-10	15.99	3-30	17.12	8-17	18.31
11-17	16.39	4-6	17.12	8-24	18.37
11-24	16.39	4-13	17.01	8-31	18.71
12-1	16.67	4-20	17.24	9-7	18.77
12-8	16.78	4-27	17.29	9-14	18.71
12-15	16.73	5-4	17.41	9-21	18.60
12-22	16.56	5-11	17.75	9-28	18.65
12-29	16.73	5-18	17.69	10-5	18.88
1-5	16.84	5-25	18.03	10-12	18.99
1-12	16.73	6-1	17.69	10-19	19.36
1-19	16.67	6-8	17.86	10-26	19.50
1-26	16.50	6-15	17.89	11-2	19.62
2-2	16.39	6-22	17.97	11-9	19.84
2-9	16.27	6-29	18.09	11-16	19.96
2-16	16.44	7-6	17.97	11-23	20.07
2-23	16.78	7-13	17.97	11-30	20.24
3-2	16.50	7-20	17.97	12-7	20.30

TABLE 534

Orville

ANTHROPOMETRIC MEASUREMENTS

Values in centimeters

AGE, months	45	48	52	61
HEIGHT,				
Horizontal	99.0	100.2	103.7	108.6
Suprasternal	76.6	77.8	81.1	85.2
Symphysis pubis	45.5	46.0	48.0	—
Tip of acromion	77.8	80.2	83.8	87.9
Cristal	55.6	55.3	60.1	62.6
Trochanter	47.6	46.4	48.5	51.4
Knee	24.7	24.4	26.0	26.3
Sitting	57.6	56.6	59.2	60.9
BREADTH,				
Acromial	19.1	19.0	20.3	25.2
Chest	—	18.2	19.5	19.2
Cristal	15.6	16.2	16.6	—
Trochanteric	17.6	18.1	19.2	—
LENGTH,				
Entire arm	31.2	32.8	33.4	34.8
Upper arm	18.8	19.2	19.6	20.1
Forearm	13.0	14.2	13.8	16.2
Hand	11.6	11.4	12.1	12.2
Tibial	20.0	20.1	21.3	21.3
GIRTH,				
Chest (ensiform)	55.2	54.1	55.9	56.2
Upper arm	17.5	16.7	17.1	18.1
Calf	21.0	21.6	22.5	23.2
Cristal	53.6	49.5	52.7	54.4



TABLE 535

Orville  
44 monthsNITROGEN, CALCIUM, PHOSPHORUS IN INTAKE, URINE, FECES  
*Values are averages per day*

Date	NITROGEN			CALCIUM			PHOSPHORUS		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.
10-20	—	—	—	1580	110	1176	—	—	—
10-27	—	—	—	1570	68	1393	—	592	—
11-3	10.79	9.62	0.87	1596	87	1308	1625	555	888
11-10	10.78	10.77	0.76	1582	108	1310	1576	754	848
11-17	10.96	12.07	0.69	1584	150	1262	1556	849	746
11-24	10.87	11.76	1.26	1588	131	1375	1597	777	803
12-1	10.81	10.74	0.95	1589	98	1508	1572	715	881
12-8	10.91	9.82	0.73	1589	85	1312	1607	704	821
12-15	10.72	10.24	0.62	1587	80	1386	1624	697	842
12-22	10.63	9.98	0.67	1585	77	1461	1562	662	886
12-29	10.85	9.69	0.73	1594	74	1321	1589	659	808
1-5	10.75	10.65	0.74	1591	78	1298	1579	737	734
1-12	10.45	10.62	0.57	1616	64	1334	1565	680	818
1-19	6.87	7.42	0.39	320	41	340	710	480	466
1-26	6.94	6.77	0.31	317	35	207	649	450	250
2-2	7.33	6.40	0.40	320	30	244	706	428	256
2-9	7.50	6.58	0.54	332	28	262	796	401	291
2-16	7.38	6.65	0.52	330	24	235	739	445	283
2-23	7.58	6.90	0.52	334	16	216	766	465	230
3-2	7.69	7.07	0.66	340	17	251	757	468	268
3-9	8.50	7.51	0.66	551	32	388	896	456	317
3-16	8.64	7.96	0.36	542	24	264	912	500	230
3-23	8.57	7.86	0.48	548	31	390	929	543	315
3-30	8.48	8.15	0.62	543	25	446	900	536	392
4-6	8.47	8.02	0.54	552	32	383	901	528	346
4-13	8.86	8.26	0.54	693	30	507	—	637	165
4-20	9.21	8.62	0.52	709	45	533	—	580	—
4-27	9.51	8.97	0.53	706	48	524	—	578	417
5-4	9.52	8.54	0.56	702	43	502	1034	582	399
5-11	10.34	8.67	0.80	909	55	556	1151	623	452
5-18	10.04	9.46	0.86	907	56	781	—	635	369
5-25	9.99	8.92	1.09	883	43	699	1161	630	574
6-8	—	—	—	—	—	—	—	—	—
6-15	—	—	—	906	43	611	—	666	532
6-22	—	—	—	896	54	686	1181	680	585
6-29	—	—	—	893	66	656	1173	638	549
7-6	—	—	—	906	53	679	—	592	—
7-13	—	—	—	894	48	643	—	626	—
7-20	—	—	—	473	41	384	—	—	—
7-27	—	—	—	479	37	338	—	—	—
8-3	8.20	6.43	0.75	483	46	324	—	—	—
8-10	7.89	6.56	0.66	509	58	323	—	—	—
8-17	8.01	6.62	0.70	501	56	280	—	—	—
8-24	8.31	6.70	0.78	497	60	296	—	—	—
9-7	7.48	6.38	0.63	488	64	292	—	—	—
9-14	7.28	6.57	0.77	—	—	—	—	—	—
9-21	7.27	6.49	0.50	345	48	221	—	—	—
9-28	8.34	6.30	0.82	346	65	170	—	—	—
10-5	7.78	6.14	0.86	347	46	168	—	—	—
10-12	7.71	6.69	0.61	357	81	216	—	—	—
10-19	8.24	6.36	0.86	364	68	200	—	—	—
10-26	8.02	6.34	1.04	368	79	167	—	—	—
				377	68	198	—	—	—
				355	50	195	—	—	—

TABLE 536

Clarence  
57 monthsAVERAGE DAILY INTAKE OF FOODS NOT INCLUDED  
IN BASAL DIET*Values in grams per day*

Date	Casein	Yeast	Milk solids	Butter	Bread	Sugar	Jelly	Corn starch	Water
10-20	—	1	114	28	23	14	30	2	643
10-27	—	1	114	28	41	14	35	4	886
11-3	—	1	114	35	57	17	64	6	700
11-10	—	1	114	36	61	18	64	6	743
11-17	—	1	114	35	50	18	71	6	686
11-24	—	1	114	43	56	18	71	6	621
12-1	—	1	114	42	46	18	67	3	721
12-8	—	1	114	36	21	18	36	3	714
12-15	—	1	114	38	30	18	34	4	728
12-22	—	1	114	32	27	23	36	4	728
12-29	—	1	114	25	20	18	20	4	707
1-5	—	1	114	24	23	18	32	4	728
1-12	—	1	114	31	36	18	56	4	836
1-19	10	1	17	35	53	18	63	3	786
1-26	10	1	17	34	68	18	63	3	914
2-2	10	1	17	36	87	18	99	3	800
2-9	10	1	17	39	77	21	95	3	814
2-16	10	1	17	36	94	21	70	3	857
2-23	10	1	17	34	76	21	70	3	1011
3-2	10	1	17	42	94	21	70	3	1000
3-9	10	1	33	43	108	21	71	3	864
3-16	10	1	33	43	103	21	70	3	1071
3-23	10	1	33	25	86	21	75	3	1128
3-30	10	1	33	34	94	21	71	3	893
4-6	10	1	33	29	63	21	71	3	1043
4-13	10	1	44	31	96	27	85	3	1000
4-20	10	1	44	31	84	21	82	3	1000
4-27	10	1	44	35	80	21	71	3	871
5-4	10	1	44	31	83	21	81	3	957
5-11	10	1	59	29	88	21	95	3	1028
5-18	10	1	59	36	98	21	85	3	1043
5-25	10	1	59	29	88	21	71	3	1028
6-8	10	1	59	21	88	31	70	3	1014
6-15	10	1	59	29	97	28	71	3	1000
6-22	10	1	59	28	80	28	71	3	1014
6-29	10	1	59	35	90	28	71	3	1000
7-6	10	1	59	18	56	28	60	3	957
7-13	10	2	17	33	107	28	70	3	943
7-20	10	2	17	20	97	28	70	3	971
7-27	10	2	17	35	100	28	84	3	1000
8-3	10	2	17	36	146	28	102	3	1071
8-10	10	2	17	53	133	28	98	3	943
8-17	10	2	17	47	111	47	70	3	1043
8-24	10	2	17	57	118	43	98	3	1000
9-7	10	2	17	42	90	46	70	3	928
9-14	10	2	17	50	68	43	71	3	943
9-21	10	2	17	40	73	47	70	3	914
9-28	10	2	17	44	66	47	60	3	914
10-5	10	2	17	46	80	33	84	3	1000
10-12	10	2	17	39	66	43	75	3	914
10-19	10	2	17	39	70	43	70	3	1000
10-26	10	2	17	39	57	43	66	3	1000

TABLE 537

Clarence  
57 months

## BODY WEIGHT

Date	kg.	Date	kg.	Date	kg.
10-20	19.73	3-9	19.67	7-27	20.64
10-27	19.62	3-16	20.41	8-3	20.52
11-3	19.62	3-23	20.52	8-10	20.64
11-10	19.96	3-30	20.64	8-17	20.86
11-17	20.13	4-6	20.41	8-24	21.20
11-24	20.47	4-13	20.52	8-31	21.20
12-1	20.52	4-20	20.52	9-7	21.09
12-8	20.58	4-27	20.52	9-14	21.26
12-15	20.58	5-4	20.41	9-21	21.26
12-22	20.52	5-11	20.47	9-28	21.38
12-29	20.52	5-18	20.47	10-5	21.43
1-5	20.41	5-25	20.70	10-12	21.77
1-12	20.35	6-1	20.86	10-19	21.77
1-19	20.52	6-8	20.64	10-26	21.94
1-26	20.18	6-15	20.58	11-2	21.88
2-2	20.18	6-22	20.75	11-9	21.88
2-9	20.13	6-29	20.64	11-16	21.88
2-16	20.18	7-6	20.52	11-23	22.06
2-23	20.35	7-13	20.58	11-30	22.28
3-2	20.13	7-20	20.52	12-7	22.23

TABLE 538

Clarence

## ANTHROPOMETRIC MEASUREMENTS

*Values in centimeters*

AGE, months	58	61	66	74
HEIGHT,				
Horizontal	108.4	110.8	112.6	117.1
Suprasternal	86.0	87.6	89.2	93.2
Symphysis pubis	52.6	53.0	54.6	—
Tip of acromion	88.8	90.3	92.8	96.0
Cristal	63.4	64.0	66.8	68.7
Trochanter	53.3	55.4	56.7	—
Knee	27.9	29.5	30.4	31.3
Sitting	60.1	61.6	62.8	63.2
BREADTH,				
Acromial	20.0	20.6	21.1	25.6
Chest	—	20.0	20.1	20.4
Cristal	17.4	18.0	18.0	19.5
Trochanteric	19.0	19.5	20.5	20.3
LENGTH,				
Entire arm	36.0	36.2	37.4	38.7
Upper arm	21.2	21.7	22.2	22.5
Forearm	15.3	15.6	15.8	16.3
Hand	12.5	12.8	13.0	13.1
Tibial	23.1	24.8	25.5	25.5
GIRTH,				
Chest (ensiform)	56.9	56.1	58.1	57.9
Upper arm	19.0	18.1	18.1	—
Calf	23.5	23.1	22.9	—
Cristal	53.6	53.3	54.4	57.3

TABLE 539

Clarence  
57 monthsNITROGEN, CALCIUM, PHOSPHORUS IN INTAKE, URINE, FECES  
*Values are averages per day*

Date	NITROGEN			CALCIUM			PHOSPHORUS		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.
10-20	—	—	—	1584	81	1446	—	—	—
10-27	—	—	—	1589	55	1399	—	—	—
11-3	11.25	9.08	1.62	1610	87	1415	1668	776	752
11-10	11.54	10.67	1.53	1616	95	1310	1643	970	684
11-17	11.68	11.89	1.32	1603	127	1439	1602	910	764
11-24	11.57	10.72	1.26	1612	121	1381	1658	884	734
12-1	11.35	10.90	1.41	1610	117	1349	1623	896	719
12-8	11.02	10.65	1.25	1595	109	1405	1619	923	746
12-15	11.03	10.32	1.16	1602	83	1475	1653	903	720
12-22	11.02	11.37	1.24	1602	88	1422	1598	913	785
12-29	10.74	10.18	0.93	1598	79	1152	1594	901	588
1-5	10.86	10.68	1.19	1594	67	1381	1587	893	522
1-12	10.90	9.82	1.13	1631	74	1293	1602	812	658
1-19	7.19	7.26	0.99	333	54	263	737	538	228
1-26	7.53	6.61	0.91	335	36	248	698	481	232
2-2	8.09	6.53	1.10	350	46	340	676	488	317
2-9	7.85	6.43	1.10	348	56	239	848	505	257
2-16	7.92	7.24	0.88	345	43	231	786	520	243
2-23	7.69	6.93	0.85	340	29	240	776	488	329
3-2	8.09	7.42	1.01	354	31	266	792	532	269
3-9	9.02	7.56	0.96	565	56	377	911	577	229
3-16	9.32	7.98	0.99	568	56	445	978	617	326
3-23	8.88	7.80	0.51	558	28	471	957	595	361
3-30	8.90	8.23	1.04	555	32	450	942	587	350
4-6	8.49	8.16	1.08	555	36	445	899	632	371
4-13	9.47	8.47	0.93	717	26	490	1038	654	322
4-20	9.41	8.32	0.99	717	50	538	1045	627	362
4-27	9.49	8.44	0.88	708	42	530	1058	637	346
5-4	9.61	9.13	0.89	706	44	582	1045	694	378
5-11	10.38	9.67	0.96	913	58	675	1160	757	418
5-18	10.39	8.99	1.20	921	80	692	1233	704	480
5-25	10.64	9.51	1.55	906	77	758	1218	694	572
6-8	—	—	—	914	57	719	1183	824	472
6-15	—	—	—	904	62	664	1204	844	406
6-22	—	—	—	900	68	705	1190	810	491
6-29	—	—	—	916	68	716	1228	764	488
7-6	—	—	—	901	42	675	1169	770	410
7-13	—	—	—	494	53	417	827	620	327
7-20	—	—	—	495	52	337	892	560	269
7-27	—	—	—	504	57	356	851	554	173
8-3	9.21	7.09	0.99	543	66	340	917	546	262
8-10	8.53	6.62	1.10	523	75	344	911	509	295
8-17	8.40	6.70	0.95	508	64	354	831	516	293
8-24	8.52	6.81	0.96	496	72	334	826	556	256
9-7	7.99	6.25	0.88	372	53	207	737	461	192
9-14	7.54	6.64	0.94	356	70	249	636	489	228
9-21	7.79	6.50	0.96	364	77	225	723	495	201
9-28	8.59	6.59	0.91	362	71	229	782	487	207
10-5	7.99	6.48	1.14	371	63	255	767	459	261
10-12	7.71	6.71	0.93	366	62	216	711	487	205
10-19	8.18	6.58	0.98	376	69	218	719	487	200
10-26	7.97	6.51	0.96	351	52	204	—	497	193

TABLE 540

Steve  
31 monthsAVERAGE DAILY INTAKE OF FOODS NOT INCLUDED  
IN BASAL DIET*Values in grams per day*

Date	Casein	Yeast	Milk solids	Butter	Bread	Sugar	Jelly	Corn starch	Water
10-20	—	1	114	14	21	14	35	2	728
11-3	—	1	114	32	20	17	32	6	700
11-10	—	1	114	28	21	18	35	6	721
11-17	—	1	114	31	24	18	42	6	600
11-24	—	1	114	32	13	18	19	6	607
12-1	—	1	114	27	11	18	19	4	714
12-8	—	1	114	28	4	18	10	3	786
12-15	—	1	114	28	11	18	17	4	700
12-22	—	1	114	23	11	23	13	4	757
12-29	—	1	114	23	20	18	17	4	786
1-5	—	1	114	23	17	18	20	4	700
1-12	—	1	114	22	16	18	24	4	828
1-19	10	1	17	24	17	18	28	3	957
1-26	10	1	17	24	24	18	30	3	757
2-2	10	1	17	25	38	18	40	3	786
2-9	10	1	17	26	46	21	63	3	921
2-16	10	1	17	23	54	21	44	3	786
2-23	10	1	17	28	68	21	56	3	1011
3-2	10	1	17	36	73	21	56	3	828
3-9	10	1	33	42	83	21	57	3	864
3-16	10	1	33	39	84	21	60	3	1086
3-23	10	1	33	28	77	21	64	3	1100
3-30	10	1	33	28	90	21	56	3	900
4-6	10	1	33	14	80	21	64	3	1000
4-13	10	1	44	20	61	27	56	3	971
4-20	10	1	44	21	64	21	56	3	971
4-27	10	1	44	16	46	21	40	3	871
5-4	10	1	44	18	38	21	57	3	971
5-11	10	1	59	22	53	21	69	3	1014
—	—	—	—	—	—	—	—	—	—
5-25	10	1	59	23	61	21	56	3	971
—	—	—	—	—	—	—	—	—	—
6-8	10	1	59	21	58	31	56	3	1000
6-15	10	1	59	16	48	28	45	3	1000
6-22	10	1	59	20	53	28	41	3	928
6-29	10	1	59	23	53	28	57	3	1000
7-6	10	1	59	14	38	28	40	3	928
7-13	10	2	17	19	47	28	46	3	957
7-20	10	2	17	27	66	28	56	3	986
7-27	10	2	17	23	50	28	47	3	1014
8-3	10	2	17	28	78	28	56	3	1057
8-10	10	2	17	43	76	28	56	3	771
8-17	10	2	17	46	61	47	54	3	1028
8-24	10	2	17	34	64	43	76	3	986
—	—	—	—	—	—	—	—	—	—
9-7	10	2	17	22	53	46	58	3	857



TABLE 541

Steve  
31 months

BODY WEIGHT

Date	kg.	Date	kg.	Date	kg.
10-20	15.14	2-9	15.88	6-1	16.78
10-27	15.31	2-16	15.82	6-8	16.90
11-3	15.36	2-23	15.99	6-15	16.95
11-10	15.59	3-2	15.93	6-22	16.73
11-17	15.82	3-9	16.04	6-29	16.95
11-24	16.10	3-16	16.39	7-6	16.90
12-1	16.16	3-23	16.50		
12-8	16.16	3-30	16.78	7-13	16.73
12-15	16.22	4-6	16.78	7-20	16.56
				7-27	16.56
12-22	16.22	4-13	16.73		
12-29	16.16	4-20	16.78	8-3	16.50
1-5	16.44	4-27	16.95	8-10	16.67
1-12	16.44	5-4	16.61	8-17	16.78
1-19	16.33	5-11	16.61	8-24	17.35
1-26	15.99	5-18	16.50	8-31	17.18
2-2	15.93	5-25	16.61	9-7	17.24

TABLE 542

Steve

ANTHROPOMETRIC MEASUREMENTS

*Values in centimeters*

AGE, months	32	35	39
HEIGHT,			
Horizontal	96.5	98.5	101.7
Suprasternal	74.9	76.8	79.2
Symphysis pubis	42.2	43.7	44.6
Tip of acromion	77.2	78.0	83.0
Cristal	53.0	53.5	57.0
Trochanter	44.2	44.8	46.6
Knee	22.6	24.4	26.0
Sitting	55.7	57.2	58.2
BREADTH,			
Acromial	19.4	19.2	20.4
Chest	—	17.8	18.8
Cristal	14.4	15.9	16.0
Trochanteric	15.8	17.2	17.8
LENGTH,			
Entire arm	29.8	30.4	31.6
Upper arm	17.8	19.2	19.5
Forearm	12.6	12.8	13.0
Hand	11.0	11.2	11.6
Tibial	18.8	20.2	21.4
GIRTH,			
Chest (ensiform)	53.3	53.3	55.7
Upper arm	17.1	16.2	16.8
Calf	21.6	21.3	21.9
Cristal	52.1	49.5	53.1

TABLE 543

Steve  
31 monthsNITROGEN, CALCIUM, PHOSPHORUS IN INTAKE, URINE, FECES  
*Values are averages per day*

Date	NITROGEN			CALCIUM			PHOSPHORUS		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.
10-20	—	—	—	1589	108	1458	—	—	—
11-3	10.64	8.77	1.14	1588	86	1465	1624	764	768
11-10	10.90	9.74	1.24	1591	77	1397	1586	856	616
11-17	11.10	10.00	1.55	1590	117	1464	1565	823	682
11-24	10.87	10.69	1.26	1583	133	1342	1597	915	749
12-1	10.81	10.37	1.18	1589	105	1322	1572	919	673
12-8	10.75	9.48	1.47	1580	108	1317	1590	861	681
12-15	10.74	9.02	1.94	1588	89	1394	1625	824	738
12-22	10.79	8.58	1.70	1592	79	1360	1677	707	792
12-29	10.91	8.14	2.08	1598	85	1303	1594	756	688
1-5	10.77	9.60	1.64	1592	84	1345	1580	876	703
1-12	10.61	9.09	1.88	1622	70	1389	1577	859	674
1-19	6.68	6.78	1.28	313	48	290	694	516	244
1-26	6.83	6.00	0.55	313	25	193	640	438	195
2-2	7.35	6.35	0.84	321	26	258	708	448	269
2-9	7.38	5.83	0.96	329	33	216	783	446	241
2-16	7.29	6.26	1.18	326	33	237	730	451	272
2-23	7.58	6.55	0.82	334	43	217	766	481	293
3-2	7.76	6.52	1.35	342	42	265	762	472	301
3-9	8.49	6.97	1.04	552	53	416	899	535	304
3-16	9.03	8.33	0.99	558	54	478	951	632	321
3-23	8.73	7.63	0.49	553	41	421	944	590	311
3-30	8.84	7.09	1.56	550	49	412	932	545	347
4-6	8.76	8.06	1.18	560	57	393	921	654	304
4-13	8.92	7.48	1.41	695	37	531	989	560	396
4-20	9.06	7.75	1.10	705	50	527	1010	615	341
4-27	8.89	7.57	1.36	686	36	479	1009	592	349
5-4	8.88	7.69	1.16	681	32	504	972	617	372
5-11	9.88	8.06	1.27	891	49	640	1108	620	416
—	—	—	—	—	—	—	—	—	—
5-25	10.23	8.95	1.65	892	65	732	1182	742	501
—	—	—	—	—	—	—	—	—	—
6-8	—	—	—	900	60	750	1142	718	550
6-15	—	—	—	885	37	700	1142	732	457
6-22	—	—	—	884	48	647	1154	782	438
6-29	—	—	—	898	40	683	—	690	498
7-6	—	—	—	888	54	622	1138	760	448
7-13	—	—	—	466	46	340	—	618	295
7-20	—	—	—	477	39	342	—	520	289
7-27	—	—	—	471	52	358	—	534	269
8-3	7.92	6.06	0.95	502	33	299	—	481	233
8-10	7.65	6.19	0.87	491	75	324	—	514	262
8-17	7.55	5.88	1.05	483	60	369	—	475	311
8-24	7.70	6.14	0.94	472	68	344	—	512	271
—	—	—	—	—	—	—	—	—	—
9-7	7.64	6.20	0.80	349	58	218	—	487	185

TABLE 544

Birch  
67 months

AVERAGE DAILY INTAKE OF FOODS NOT INCLUDED  
IN BASAL DIET

*Values in grams per day*

Date	Casein	Yeast	Milk solids	Butter	Bread	Sugar	Jelly	Corn starch	Water
10-20	—	1	114	28	40	14	57	2	743
10-27	—	1	114	28	38	14	56	4	928
11-3	—	1	114	42	56	17	56	6	714
11-10	—	1	114	43	57	18	64	6	728
11-17	—	1	114	42	57	18	71	6	614
11-24	—	1	114	43	48	18	68	6	636
12-1	—	1	114	43	50	18	69	3	743
12-8	—	1	114	39	31	18	51	3	786
12-15	—	1	114	42	54	18	57	4	728
12-22	—	1	114	32	34	23	42	4	728
12-29	—	1	114	32	26	18	35	4	786
1-5	—	1	114	33	31	18	48	4	728
1-12	—	1	114	32	27	18	40	4	828
1-19	10	1	17	36	58	18	59	3	957
1-26	10	1	17	36	68	18	63	3	957
2-2	10	1	17	36	94	18	97	3	771
2-9	10	1	17	43	77	21	92	3	1000
2-16	10	1	17	40	84	21	61	3	878
2-23	10	1	17	29	70	21	64	3	1011
3-2	10	1	17	42	94	21	70	3	1000
3-9	10	1	33	43	101	21	71	3	857
3-16	10	1	33	39	87	21	70	3	1143
3-23	10	1	33	43	94	21	78	3	1143
3-30	10	1	33	26	63	21	52	3	886
4-6	10	1	33	32	83	21	70	3	1043
4-13	10	1	44	20	60	27	59	3	1028
4-20	10	1	44	32	91	21	82	3	1071
4-27	10	1	44	28	70	21	70	3	886
5-4	10	1	44	26	53	21	65	3	986
5-11	10	1	59	28	78	21	85	3	1028
5-18	10	1	59	32	88	21	85	3	1057
5-25	10	1	59	34	116	21	85	3	986
6-15	10	1	59	25	70	28	63	3	1200
6-22	10	1	59	23	76	28	60	3	1157
6-29	10	1	59	26	56	28	59	3	1043
7-6	10	1	59	16	51	28	42	3	914
7-13	10	2	17	32	104	28	70	3	986
7-20	10	2	17	34	93	28	70	3	993
7-27	10	2	17	36	107	28	84	3	1028
8-3	10	2	17	36	148	28	99	3	1071
8-10	10	2	17	53	130	28	98	3	843
8-17	10	2	17	43	104	47	77	3	1171
8-24	10	2	17	46	90	43	96	3	1028
9-7	10	2	17	46	80	46	70	3	928
9-14	10	2	17	54	77	43	71	3	914
9-21	10	2	17	40	84	47	71	3	928
9-28	10	2	17	40	74	47	78	3	928
10-5	10	2	17	45	81	33	85	3	1000
10-12	10	2	17	42	74	43	85	3	928
10-19	10	2	17	44	73	43	70	3	1043
10-26	10	2	17	41	69	43	70	3	1000
11-2	10	2	17	35	70	43	68	3	986
11-9	10	2	17	38	74	43	70	3	971
11-16	10	2	17	42	71	43	70	3	971
11-23	10	2	17	36	66	47	83	3	928
11-30	10	2	17	31	66	43	57	3	700

TABLE 545

Birch  
67 months

## BODY WEIGHT

Date	kg.	Date	kg.	Date	kg.
10-20	21.66	3-9	22.51	7-27	22.28
10-27	21.77	3-16	22.79	8-3	22.62
11-3	21.94	3-23	22.74	8-10	22.79
11-10	22.06	3-30	22.96	8-17	22.96
11-17	22.45	4-6	22.68	8-24	23.13
11-24	22.68	4-13	22.62	8-31	23.13
12-1	22.91	4-20	22.79	9-7	23.19
12-8	23.13	4-27	22.57	9-14	23.19
12-15	23.08	5-4	22.51	9-21	23.25
12-22	22.96	5-11	22.40	9-28	23.53
12-29	22.91	5-18	22.40	10-5	23.70
1-5	23.13	5-25	22.68	10-12	23.93
1-12	23.08	6-1	22.68	10-19	24.24
1-19	23.13	6-8	22.62	10-26	24.21
1-26	22.85	6-15	22.68	11-2	24.27
2-2	22.74	6-22	22.57	11-9	24.32
2-9	22.79	6-29	22.57	11-16	24.32
2-16	22.68	7-6	22.34	11-23	24.32
2-23	22.74	7-13	22.40	11-30	24.55
3-2	22.57	7-20	22.23	12-7	24.41

TABLE 546

Birch

## ANTHROPOMETRIC MEASUREMENTS

*Values in centimeters*

AGE, months	68	71	75	84
HEIGHT,				
Horizontal	114.0	115.8	117.2	121.5
Suprasternal	91.6	93.1	94.4	98.4
Symphysis pubis	55.2	56.1	57.1	—
Tip of acromion	93.9	96.0	97.2	100.5
Cristal	66.7	68.6	69.7	70.8
Trochanter	57.0	57.5	58.4	60.6
Knee	30.0	29.2	30.7	31.4
Sitting	63.7	63.6	64.2	65.6
BREADTH,				
Acromial	20.4	19.2	20.7	26.1
Chest	—	18.6	18.9	19.2
Cristal	16.9	17.8	18.0	20.4
Trochanteric	20.0	20.2	21.2	—
LENGTH,				
Entire arm	37.0	37.6	37.8	39.7
Upper arm	22.1	22.2	22.0	22.6
Forearm	16.1	16.0	16.5	17.4
Hand	12.9	12.9	13.5	13.3
Tibial	25.3	25.4	25.8	26.8
GIRTH,				
Chest (ensiform)	55.2	54.9	57.2	56.1
Upper arm	19.4	18.9	19.0	18.8
Calf	24.8	24.4	24.8	24.8
Cristal	56.4	55.4	53.1	54.4

TABLE 547

Birch  
67 months

## NITROGEN, CALCIUM, PHOSPHORUS IN INTAKE, URINE, FECES

*Values are averages per day*

Date	NITROGEN			CALCIUM			PHOSPHORUS		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.
10-20	—	—	—	1602	114	1242	—	—	—
10-27	—	—	—	1590	94	1425	—	—	—
11-3	11.23	9.84	1.40	1608	132	1457	1665	689	907
11-10	11.47	11.16	1.08	1588	152	1217	1617	886	672
11-17	11.65	11.48	1.11	1611	202	1486	1612	910	705
11-24	11.45	11.37	1.24	1608	235	1464	1648	901	863
12-1	11.42	11.26	1.08	1614	220	1440	1630	903	841
12-8	11.18	10.79	1.02	1598	177	1322	1616	878	872
12-15	11.40	10.68	1.11	1614	182	1476	1686	874	799
12-22	11.13	11.01	0.97	1604	148	1502	1608	814	886
12-29	10.98	10.03	0.80	1590	140	1249	1583	759	718
1-5	10.99	11.35	0.94	1602	165	1542	1596	943	772
1-12	10.79	10.79	0.89	1626	153	1465	1592	861	734
1-19	7.27	7.39	0.74	336	85	294	743	558	270
1-26	7.53	6.86	0.68	335	78	249	698	476	230
2-2	8.20	6.97	0.96	352	58	272	780	165	286
2-9	7.86	6.25	0.92	349	58	230	856	446	248
2-16	7.76	7.46	0.69	340	58	226	771	523	258
2-23	7.60	7.29	0.66	335	43	249	767	513	386
3-2	8.09	7.23	0.72	351	60	211	789	473	221
3-9	8.73	7.94	1.51	558	75	367	916	627	309
3-16	8.70	8.77	0.84	560	78	386	955	603	330
3-23	9.01	8.18	0.93	562	50	487	970	553	386
3-30	8.44	7.95	0.83	539	57	356	899	560	319
4-6	8.81	8.27	0.75	563	55	338	934	575	313
4-13	8.90	8.58	0.86	693	40	456	984	613	367
4-20	9.56	8.07	0.88	726	70	580	1060	553	430
4-27	9.34	9.93	0.60	689	67	472	1023	659	350
5-4	9.11	8.49	1.03	689	42	594	998	503	486
5-11	10.28	9.07	0.90	911	66	562	1153	679	408
5-18	10.23	9.66	0.94	916	105	738	1220	727	520
5-25	11.07	9.29	0.94	922	140	644	1254	750	467
6-15	—	—	—	895	79	622	1170	742	474
6-22	—	—	—	896	115	582	1182	768	458
6-29	—	—	—	899	79	667	1180	702	541
7-6	—	—	—	893	58	618	1156	692	487
7-13	—	—	—	492	66	421	824	610	366
7-20	—	—	—	496	82	332	886	582	301
7-27	—	—	—	511	118	297	865	564	164
8-3	9.26	7.06	0.96	544	140	339	901	556	282
8-10	8.49	6.87	0.99	523	108	320	913	491	296
8-17	8.27	6.41	0.93	507	103	314	827	497	298
8-24	8.10	7.05	0.92	486	101	318	805	520	288
9-7	8.13	6.80	0.80	367	124	221	727	520	216
9-14	7.74	6.75	0.86	361	142	240	649	512	234
9-21	—	—	—	369	136	192	736	518	194
9-28	8.80	6.66	0.92	369	128	214	794	501	238
10-5	8.02	6.35	0.99	371	144	206	769	485	247
10-12	7.84	6.92	0.63	371	123	196	719	495	144
10-19	8.24	6.70	0.94	377	141	197	723	528	209
10-26	8.20	6.45	0.95	360	122	181	—	497	210
11-2	7.94	6.40	0.94	359	126	192	—	423	—
11-9	8.02	6.77	0.88	352	118	166	—	501	191
11-16	7.96	6.79	0.85	344	103	182	—	471	227
11-23	—	6.52	0.96	348	131	213	—	479	230
11-30	7.64	6.78	0.83	344	126	156	—	516	208





## ADDENDA



## OSTEOPSATHYROSIS AND UNUNITED FRACTURE

The balance studies of M.F. and D.B. were made in 1931 with the hope that some light might be thrown upon the changes in mineral metabolism responsible for or resulting from these not uncommon clinical entities. After the data were obtained, their usefulness was greatly restricted by the lack of comparable values for normal children. Only two other studies of children were found which contained values for the seven acid-base minerals and the subjects of these earlier studies were on high-fat and low-fat diets. This experience crystallized the resolve to conduct extensive studies of the mineral utilization of normal children, the results of which are now being published under the title *Nutrition and Chemical Growth in Childhood*.

A report of the cases of osteopsathyrosis and ununited fracture was published in 1935\* but to facilitate comparisons the data have been included in this volume, accompanied by the case histories and reprinted, with additions, by courtesy of the *American Journal of Diseases of Children*.

### Osteopsathyrosis†

**History:** M.F., a girl of 11 years, was admitted for study in November 1931, because of frequent fractures from slight cause and marked, increasing scoliosis, for which she was receiving orthopedic treatment from one of the members of the staff.

The family history was irrelevant, and there had been nothing of note in the patient's first year of life, except that cereals and vegetables were given rather late and that she had received no cod liver oil, though orange juice was given. There was no history of the ordinary symptoms of rickets. She walked at the age of 16 months.

She had measles, mumps and chickenpox in early childhood, but was not subject to coughs, colds or sore throat. She had oc-

\* Cooley, Thomas B., Grover C. Penberthy, Lillian Armstrong, Helen A. Hunscher, Frances Cope and Icie G. Macy. Mineral Metabolism: A Case of Osteopsathyrosis and One of Ununited Fracture. *Am. J. Dis. Children*, 50: 431, 1935.

† This name is used not in the sense of an exact diagnosis but because it comes as near to describing the condition as does any term in the rather vague classification of the disorders of bone.

casional nosebleed and always had noticeably cold hands. The sclerae were blue and there were dark circles under the eyes.

The patient had had five fractures, all below the knees. The first occurred at the age of about 13 months, for no definite cause; the second, at 2 years, followed an effort to stand on tip-toe; the third occurred on a slight fall on a slippery sidewalk, and the fourth happened with a slip on the kitchen floor. After the third fracture she received treatment for rickets, including cod liver oil and therapy from a quartz mercury vapor arc lamp. After the fourth fracture she wore braces for a long time and had no more fractures until the summer of 1930, when she turned an ankle on the sidewalk and fractured the left tibia, which resulted in a shortening of about  $\frac{1}{2}$  inch (1.2 cm.). Healing occurred in a normal time after each fracture.

The scoliosis was first noticed in June 1931. She had seemed well up to that time. The deformity increased rapidly. She grew considerably in height during the year preceding admission to the hospital.

**Physical Examination:** The patient was a pleasant-tempered, bright-appearing child. She was moderately well grown and slender, with good musculature and little fat. Her coloring was brunette, and her hair was black, rather coarse and dry. Her skin was clear and of normal texture and moisture. There was a large pigmented mole just below and to the left of the navel. The sclera were definitely blue.

The head was well shaped and dolichocephalic. The eyes and ears were normal. The tonsils were small and not obviously diseased.

The neck was normal. There was no palpable goiter or parathyroid bodies and no adenoid swellings.

The thorax showed marked scoliosis involving the whole dorsal segment of the spine, with the convexity to the right and a corresponding deformity of the ribs.

The heart, lungs and abdomen were normal.

There were no deformities of the arms or legs. No callus was felt on the bones of the legs except one small lump at the junction of the middle and lower thirds of the left tibia. The measurement from the anterior superior spine of the ilium to the external malleolus on the right was 76 cm. and on the left, 75 cm.

There were no glandular enlargements.





FIGURE 760. Osteopsathyrosis (M.F.). Scoliosis, with no evidence of destruction of the vertebrae.

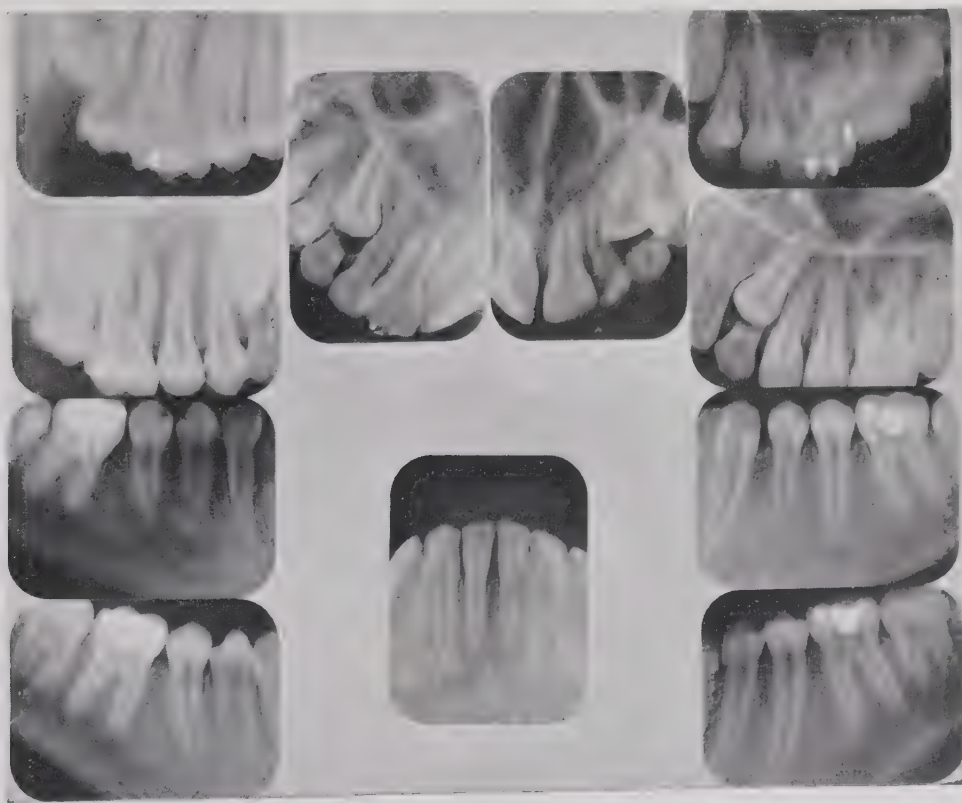


FIGURE 761. Osteopsathyrosis, (M. F.) age 133 months.

The neurologic examination gave negative results.

The metabolic rate was  $-5$  per cent.

**Roentgen Examination:** Films had been made of practically the whole skeleton in April and in July 1931. These showed normal epiphyseal development everywhere and good general development of the bones. There seemed to be slightly less than the normal calcium content of all the bones; the decrease was most noticeable in the ribs, in which some slight cystic changes, not of the type seen in parathyroid disturbance, were observed in the first films. Trabeculation seemed normal.

There was marked scoliosis, with dorsal convexity to the right and lumbar convexity to the left. No destruction of any vertebrae was seen. The bones of the legs showed no abnormalities except slight scars of healed fractures in the left tibia and in the proximal phalanx of the fourth toe, with no displacement.

**Dental Examination:** Hypoplasia of the permanent teeth, some rough and with improperly formed enamel, a few areas of defective calcification and twelve carious permanent teeth were revealed.

**Psychologic Examination:** The child was above the average in intelligence and of normal behavior except for the suggestion of nervous strain given by closely bitten finger-nails.

TABLE 548

Osteopsathyrosis (M.F.)

## DIET GIVEN DURING MINERAL BALANCE STUDIES

*Values in grams per day*

Apple	100	Candy (average)	13	Orange juice	100
Banana	100	Celery	20	Potato	70
Beef	100	Cheese, American	15	Salt (average)	2
Bread, white	60	Cocoa	5	Shredded wheat	28
Bread, whole wheat	30	Egg	50	Sugar (average)	30
Butter, filtered	30	Lettuce	20	Tomato	60
Cabbage or carrots	50	Milk	400	Water (average)	578

TABLE 549

## Osteopsathyrosis (M.F.)

## BLOOD MINERALS AND BLOOD CELL COUNTS

	Novem- ber 12	Decem- ber 5		Decem- ber 5
	mg./100 ml.			
Calcium, total serum	12.70	11.85	Red cells (millions)	4.14
			Hemoglobin* (per cent)	80
Phosphorus, inorganic			White cells	8200
Corpuscles	4.28	2.82	Polymorphonuclears	
Plasma	5.18	1.37	(per cent)	58
			Large lymphocytes	
			(per cent)	17
Magnesium, serum	3.54	2.06	Small lymphocytes	
Cholesterol	148	109	(per cent)	20
			Monocytes (per cent)	3
			Eosinophils (per cent)	1
			Platelets (thousands)	300
			Volume of corpuscles	
			(per cent)	50

\* Sahli.

TABLE 550

## Osteopsathyrosis (M.F.)

## BODY LENGTH AND WEIGHT—INTAKE AND ELIMINATION

Date	Recum- bent length	Weight	INTAKE			AVERAGE DAILY HEAT OF COMBUSTION*		FECES		
			AVERAGE DAILY			Intake	Feces	AVERAGE DAILY		
			Dry weight	Total water†	Fat			Wet weight	Dry weight	Fat
mo.-day	cm.	kg.	gm.	gm.	gm.	Cal.	Cal.	gm.	gm.	gm.
11-12	—	31.0	335	1616	68.6	2067	114	76.6	17.6	2.0
11-17	—	30.6	347	1563	68.0	2043	85	70.4	13.6	1.5
11-22	139.1	30.4	356	1471	77.7	2106	90	57.6	14.4	1.8
11-29	—	30.3	338	1476	66.4	2157	111	62.6	14.7	1.7

\* Basal metabolism, 1126 Calories per day (—5 per cent, Aub-DuBois standard).

† Drinking water plus water in food.

TABLE 551

## Osteopsathyrosis (M.F.)

## NITROGEN AND NEGATIVE MINERALS IN INTAKE, URINE, FECES

*Values are averages per day*

Date*	NITROGEN			PHOSPHORUS			CHLORINE			SULFUR		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
11-12	9.73	8.41	0.99	1040	470	420	3020	5810	40	660	510	90
11-17	9.73	8.17	0.77	1040	600	330	3140	3740	40	660	500	50
11-22	9.73	8.19	0.71	1040	620	330	2900	3410	30	660	520	70
11-29	9.73	8.36	0.90	1040	710	360	3140	2880	20	660	500	60

\* Dates are first days of balance periods.

TABLE 552

Osteopsathysosis (M.F.)

## POSITIVE MINERALS IN INTAKE, URINE, FECES

*Values are averages per day*

Date*	CALCIUM			MAGNESIUM			SODIUM			POTASSIUM		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
11-12	800	60	480	340	100	180	1470	1210	30	3950	2580	440
11-17	800	70	450	340	100	160	1550	1410	30	3950	2900	300
11-22	800	60	490	340	120	160	1390	1270	20	3950	2700	340
11-29	800	50	470	340	110	170	1550	1480	20	3950	2590	330

\* Dates are first days of balance periods.

TABLE 553

Osteopsathyrosis (M.F.)

## URINE VOLUME, pH AND ACIDITY

Date	pH	Specific gravity	Urine volume	Titration acidity
mo.-day			ml.	meq.
11-12	—	—	1460	—
11-13	—	—	1263	—
11-14	—	—	1096	—
11-15	6.2	—	745	23.7
11-16	6.4	—	1025	18.6
11-17	6.2	1.015	1332	20.6
11-18	6.4	1.042	1040	19.0
11-19	6.1	1.015	1135	22.9
11-20	6.0	1.023	765	24.9
11-21	6.6	1.020	1308	19.0
11-22	5.9	1.018	860	25.8
11-23	5.9	1.013	1268	25.5
11-24	6.2	1.021	842	21.5
11-25	6.4	1.013	1214	17.0
11-26	5.8	1.016	962	28.8
11-27	6.5	1.019	965	22.0
11-29	6.2	1.019	952	22.2
11-30	6.2	1.019	885	23.0
12-1	6.3	1.016	1040	23.6
12-2	5.8	1.022	822	26.2
12-3	6.6	1.021	927	12.7
12-4	—	—	817	17.0
12-5	—	—	835	—

TABLE 554

## Osteopsathyrosis (M.F.)

## NITROGEN PARTITION OF URINE

*Values in grams of nitrogen per day*

Date	Total nitrogen	Urea	Ammonia	Creatinine + creatine	Creatinine	Uric acid
11-12	9.12	8.142	0.380	0.365	0.224	0.092
11-13	8.53	6.941	0.445	0.306	0.204	0.095
11-14	8.77	7.022	0.346	0.356	0.219	0.121
11-15	7.39	7.967	0.451	0.256	0.207	0.098
11-16	7.07	7.130	0.298	0.674	0.241	0.105
11-17	8.22	6.018	0.310	0.296	0.202	0.097
11-18	7.51	6.206	0.228	0.290	0.203	0.110
11-19	7.34	7.556	0.264	0.241	0.195	0.102
11-20	8.87	7.405	0.266	0.408	0.314	0.106
11-21	7.73	5.744	0.193	0.579	0.369	0.121
11-22	9.35	4.364	0.299	0.240	0.158	0.098
11-23	10.50	6.550	0.210	0.272	0.190	0.097
11-24	8.13	6.359	0.191	0.327	0.219	0.111
11-25	7.01	6.535	0.187	0.299	0.248	0.086
11-26	8.06	4.951	0.162	0.429	0.322	0.126
11-29	9.21	6.873	0.221	0.248	0.216	0.100
11-30	7.70	6.797	0.163	0.263	0.245	0.100
12-1	8.30	6.473	0.246	0.272	0.214	0.096
12-2	8.02	7.848	0.202	0.250	0.191	0.103
12-3	9.26	5.839	0.224	0.296	0.267	0.121

## Ununited Fracture

**History:** D.B., a girl of  $7\frac{1}{2}$  years, was admitted to the hospital in September 1931 because of ununited fractures of the right tibia.

The family history was wholly irrelevant. The child had apparently been a normal baby, breast fed for three months and then given a dried milk preparation. She had no cod liver oil until the age of 18 months, but received plenty of sunlight. She seemed to develop normally until it was noticed that she showed no inclination to walk at the ordinary time, and bowing of the right tibia was observed, for which the family physician applied an apparatus with no effect. When at the age of 2 years she did not walk, an orthopedic surgeon diagnosed severe rachitic deformity and performed an osteotomy. Some months later the fracture was found not to have healed, and an inlay of bone was inserted. She remained in the hospital for a year, receiving treatment with



sunlight, massage and cod liver oil. She then had a variety of treatments in a number of clinics, including various diets, apparatus, physical therapy and four bone grafting operations. At times there seemed to be slight union, which always broke down. Following one of the operations, hemiplegia developed, which was supposed to be due to fat embolism. Recovery from this was complete after several months, but in the meantime the child became left-handed. When she was admitted to the Children's Hospital she was wearing a brace, by means of which she got around fairly well.

**Physical Examination:** D.B., was a bright, well behaved child. She was plump and well developed, with blond coloring and brown hair and a clear skin of good color and texture. The sclerae were normal.

The head was well shaped. The eyes and the ears were normal. The tonsils were of medium size and were moderately diseased. There was considerable lymphoid hyperplasia on the posterior pharyngeal wall. The neck was normal.

The thorax was well developed, with no deformity. The lungs were normal. The heart area and heart rate were normal. There was a soft systolic murmur which was not transmitted. The abdomen was normal.

The arms and thighs were normal. A brace was worn on the right leg. Both legs showed scars of old operations. There was approximately 3 cm. shortening of the right leg.

The neurologic examination gave normal results.

**Roentgen Examination:** On Sept. 10, 1931, films were made of both legs in two planes; of the forearms and arms in the anteroposterior plane; of the skull in the right and left lateral projections, and of the pelvis and the regions of both thighs in the anteroposterior projection.

The films demonstrated ununited fractures through the shaft of the tibia in the middle third. The fragments were in end-to-end contact, but there was slight lateral angulation at the points of fracture. There was considerable diminution in the diameter of both the tibia and the fibula of the left leg. Both the bones showed definite loss of line substance, and there were transverse striations through the diaphyseal ends which we interpreted as indicating so-called growth lines. Similar lines were demonstrated in the films of the forearms. There was no apparent disturbance in the normal epiphyseal development.

The film of the right leg showed some thickening of the cortex

of the tibia with slight periosteal roughening but no changes to suggest a definite destructive disease.

The films of the skull revealed no unusual changes in the contour or detail of the cranial vault.

On Sept. 9, 1933, additional study was made of the left leg. There was a slight increase in the amount of callus about the fractures, but the segments were not firmly united (Figure 762).

**Examination of the Legs:** There was atrophy of the right leg, with some apparent shortening. The distance from the umbilicus to the internal malleolus on the right measured 31 inches (78.7 cm.) and on the left, 32 inches (81.2 cm.). The distance from umbilicus to the inferior border of the patella was  $18\frac{1}{2}$  inches (47 cm.) on both the right and the left. There were scars on the anterior aspect of both the left and the right leg, the result of operations. There were good flexion and extension at the right knee and ankle. There was some lateral bowing of the middle third of the right leg as well as false motion of the middle third of the right tibia. The fibula was intact.

**Dental Examination:** Caries was present in eight deciduous and four permanent teeth, and there was nonunion of the sulci in the six year molars. There was evidence of hypoplasia in both the deciduous and the permanent teeth, and there were some areas of imperfect calcification. Dr. Charles Bodecker, professor of oral histology and embryology at Columbia University, examined an extracted molar and reported poor calcification of both the enamel and the dentin, with resorption at the margins of the pulp canals followed by the formation of osteoid tissue, indicating the activity of a pathologic process in the pulp (Figure 763).

**Psychologic Examination:** The child had a rather low average of general intelligence. She had been somewhat overprotected. There was, however, nothing of special significance.

**Final Record:** Under the date of February 4, 1935 the following was entered in the file on this case:

Patient will be eleven years of age in May of this year. As previous record indicates, this patient has been operated upon for nonunion of right tibia six or seven times, with no apparent union. This case falls into the group where there must be some metabolic disturbance, as well as some disturbance in the blood supply to the middle third of the right tibia (pseudo arthrosis). As child approaches maturity some results may be obtained by the use of massive bone inlay. The leg apparently continues to grow and the father states it has shown considerable progress since it was taken out of the cast.

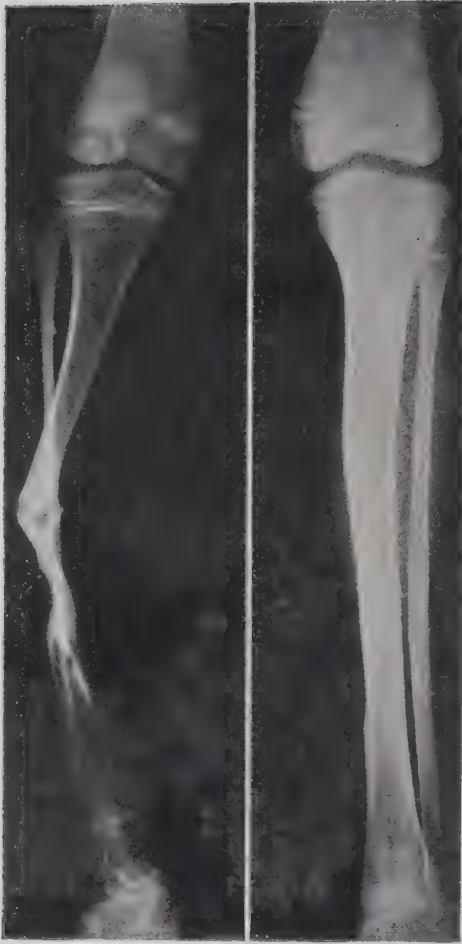


FIGURE 762. Ununited Fracture (D.B.). Increased amount of callus about the fractures, but the segments not firmly united.

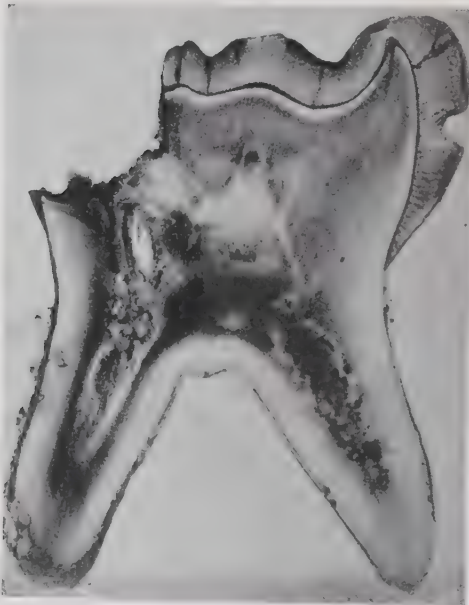


FIGURE 763. Histological Findings, Lower Molar of D.B.

The ground section shows that the enamel is not well calcified noted by the marked visibility of the individual enamel rods. Dental caries is extensive. The dentin is very poorly calcified as indicated by the presence of exceedingly small interglobular spaces in the ground section. The same condition is indicated by the dappled appearance of decalcified specimens stained by Haematoxylin-eosin.

The zone of last formed dentin lining the pulp chamber (predentin, eosinophile) is abnormally wide showing marked irregularities. The margins of both pulp canals are also strikingly abnormal showing resorption followed by the formation of osteoid tissue. This indicates the activity of a pathological pulp.—Charles F. Bodecker, Professor of Oral Histology and Embryology, Columbia University, New York.

TABLE 555

## Ununited Fracture (D.B.)

## BLOOD MINERALS AND BLOOD CELL COUNTS

	Novem- ber 3	Decem- ber 3		Decem- ber 3
	mg./100 ml.		Red cells (millions)	4.61
Calcium, total serum	12.45	12.15	Hemoglobin* (per cent)	85
Phosphorus, inorganic			White cells	5800
Corpuscles	3.00	9.01	Polymorphonuclears	40
Plasma	4.15	3.99	Large lymphocytes (per cent)	18
Magnesium, serum	1.80	2.14	Small lymphocytes (per cent)	32
Cholesterol	85	97	Monocytes (per cent)	1
			Basophiles (per cent)	1
			Eosinophils (per cent)	8
			Platelets (thousands)	300
			Volume of corpuscles (per cent)	46

\* Sahli.

TABLE 556

## Ununited Fracture (D.B.)

## DIET GIVEN DURING MINERAL BALANCE STUDIES

*Values in grams per day*

Apple	100	Candy (average)	10	Orange juice	100
Banana	100	Celery	20	Potato	70
Beef	100	Cheese, American	15	Shredded wheat	28
Bread, white	60	Cocoa	5	Tomato	60
Bread, whole wheat	30	Egg	50	Sugar (average)	28
Butter	30	Lettuce	20	Water (average)	349
Cabbage or carrots	50	Milk	400	Salt	1

TABLE 557

## Ununited Fracture (D.B.)

## BODY LENGTH AND WEIGHT—INTAKE AND ELIMINATION

Date	Recum- bent length	Weight	INTAKE			AVERAGE DAILY HEAT OF COMBUSTION		FECES		
			AVERAGE DAILY			Intake	Feces	AVERAGE DAILY		
			Dry weight	Total water*	Fat			Wet weight	Dry weight	Fat
mo.-day	cm.	kg.	gm.	gm.	gm.	Cal.	Cal.	gm.	gm.	gm.
11-8	—	23.5	307	1712	67.2	1977	88	51.6	13.8	1.7
11-13	—	23.5	339	1297	68.6	2089	86	54.6	13.3	1.2
11-18	—	23.5	337	1181	68.0	2012	97	60.4	15.5	1.7
11-23	127.0	23.6	354	1152	77.7	2106	100	54.0	14.9	1.6
11-29	—	23.7	334	1065	66.4	2146	92	53.4	13.3	1.5

\* Drinking water plus water in food.



TABLE 558

Ununited Fracture (D.B.)

## POSITIVE MINERALS IN INTAKE, URINE, FECES

*Values are averages per day*

Date*	CALCIUM			MAGNESIUM			SODIUM			POTASSIUM		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
11-8	800	130	590	343	116	142	1150	1230	10	3950	1600	380
11-13	800	100	550	343	88	145	1150	1400	10	3950	2760	240
11-18	800	90	670	343	99	171	1070	1300	10	3950	2890	240
11-23	800	60	640	343	101	160	1070	1340	10	3950	2620	360
11-29	800	60	540	343	89	116	1070	980	10	3950	2720	320

\* Dates are first days of balance periods.

TABLE 559

Ununited Fracture (D.B.)

## URINE VOLUME, pH, AND ACIDITY

Date	pH	Specific gravity	Urine volume	Titration acidity
mo.-day			ml.	meq.
11-13	—	—	1525	—
11-14	—	—	730	—
11-15	6.7	—	690	11.8
11-16	6.8	—	920	23.3
11-17	6.7	1.014	1330	10.7
11-18	6.6	1.017	935	12.7
11-19	6.8	1.014	998	10.7
11-20	6.8	1.024	580	12.7
11-21	6.8	1.020	845	9.9
11-22	6.8	1.016	958	11.5
11-23	6.8	1.020	750	11.7
11-24	6.8	1.025	665	10.4
11-25	6.8	1.013	976	17.4
11-26	6.8	1.021	747	12.0
11-27	6.8	1.020	895	14.5
11-29	6.8	1.025	730	12.8
11-30	6.7	1.024	645	12.4
12-1	6.8	1.024	757	14.7
12-2	6.8	1.029	535	13.8
12-3	6.8	1.028	623	7.6



TABLE 560

## Ununited Fracture (D.B.)

NITROGEN AND NEGATIVE MINERALS IN INTAKE, URINE, FECES  
*Values are averages per day*

Date	NITROGEN			PHOSPHORUS			CHLORINE			SULFUR		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
	gm.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
11-8	9.73	7.99	0.79	1040	540	420	2530	6340	20	662	512	72
11-13	9.73	7.68	0.75	1040	440	450	2530	5700	20	662	500	61
11-18	9.73	7.56	0.81	1040	550	420	2410	2740	20	662	493	70
11-23	9.73	8.15	0.94	1040	670	440	2410	2560	20	662	511	53
11-29	9.73	8.37	0.84	1040	610	320	2410	2090	30	662	509	59

TABLE 561

## Ununited Fracture (D.B.)

NITROGEN PARTITION OF URINE

*Values in grams of nitrogen per day*

Date	Total nitrogen	Urea	Ammonia	Creatinine + creatine	Creatinine	Uric acid
11-9	5.98	4.685	0.353	0.284	0.181	—
11-10	7.44	5.724	0.388	0.238	0.134	0.110
11-11	7.68	6.100	0.440	0.246	0.157	0.125
11-12	6.49	6.289	0.524	0.255	0.160	0.089
11-13	7.93	6.383	0.402	0.224	0.144	0.097
11-14	7.91	6.857	0.282	0.238	0.142	0.104
11-15	7.55	—	0.260	0.191	0.164	0.100
11-16	6.52	6.270	0.138	0.221	0.118	0.095
11-17	7.73	5.918	0.507	0.376	0.213	0.101
11-18	7.68	6.212	0.201	0.214	0.142	0.106
11-19	7.00	5.901	0.208	0.205	0.144	0.100
11-20	7.92	6.450	0.178	0.249	0.096	0.099
11-21	7.49	8.233	0.187	0.319	0.249	0.115
11-22	7.62	6.275	0.220	0.238	0.192	0.112
11-23	8.43	6.481	0.306	0.210	0.135	0.097
11-24	9.34	6.116	0.143	0.230	0.169	0.078
11-25	7.25	5.892	0.165	0.277	0.152	0.080
11-26	8.04	4.501	0.144	0.328	0.232	0.093
11-27	7.81	6.543	0.168	0.276	0.189	0.118
11-29	10.36	9.689	0.196	0.181	0.116	0.088
11-30	9.87	8.248	0.129	0.214	0.158	0.081
12-1	9.96	7.819	0.213	0.291	0.122	0.099
12-2	10.06	9.399	0.189	0.243	0.170	0.093
12-3	9.53	7.610	0.163	0.241	0.154	0.113

## LIPEMIA

A paper published from this laboratory in 1939 reported the results of mineral balance studies of a case of essential hyperlipemia.\* The data presented consisted of the values obtained during two balance periods upon a low-fat diet and two periods on a high-fat diet. About three years following the first balance studies of R.B. the boy was included with the group of children who composed Study III in the investigation of nutrition and chemical growth in childhood. During the interval R.B. had been a patient of the same pediatrician (S.S.B.). The data and case history from the early study are reprinted here by courtesy of *The Journal of Pediatrics* and expanded with the information procured in the following years.

The mother, 26 years of age at the time the child was born, has always been well, is a first cousin to the father, and has borne two other healthy siblings. Following a normal prenatal period and delivery, the baby weighed 9 pounds 3 ounces and gained normally throughout the first year upon breast feedings, irregularly supplemented with orange juice and with cereals and vegetables from the age of 6 months (no cod liver oil was given). The father, an English citizen, developed schizophrenia when the child was 1 year old and the economic status of the family after this occurrence was such that the baby did not receive an adequate amount of food. The child did not gain in weight during his second year; he was pale; and his abdomen became protuberant. At a clinic the mother was told that he was suffering from malnutrition, that he was anemic and rachitic.

When the child was two years old the family moved to England, where the baby received an adequate diet supplemented by cod liver oil. A month later an asymptomatic rash of small pink papules developed in the face, neck and the extremities. After a short interval these papules exuded a milky, semiviscous fluid. While some papules were disappearing and others occurring, a biopsy was made on one of the lesions, but no diagnosis could be made. Two years later the lesions gradually disappeared but persistent yellow patches remained under some of the finger and toe nails.

\* Bernstein, Samuel S., Harold H. Williams, Frances C. Hummel, Marion L. Shepherd and Betty Nims Erickson. Metabolic observations on a Child with Essential Hyperlipemia. *J. Pediatrics*, 14: 570, 1939.

The child was admitted to the Children's Hospital of Michigan, Nov. 16, 1936 (two weeks after his return to the United States), after five days during which he complained of frequently occurring abdominal cramps of short duration. The boy had no appetite, some nausea, but no fever. Physical examination showed the boy to be fairly well nourished and developed. There were a few fine, yellow-tinged papules over the elbows and knees. Several small yellow patches were visible under the nails of the great toes and thumbs. His head showed some frontal bossing. The thorax was flared at the lower rib margins and Harrison's groove was present.

The abdomen was protuberant, soft, but not tender. The edge of the liver was palpable one fingerbreadth below the costal margin. The spleen, palpated three fingerbreadths below the costal margin, felt smooth and hard. Some firm fecal material could be felt in the colon. The abdominal pain from which the patient had been suffering, probably due to a mild fecal impaction, was completely relieved by a cleansing enema and did not recur. Repeated urine examinations were negative. Red blood cell and differential white cell counts were normal. When blood was drawn for Wassermann and agglutination tests in attempting to get at the cause of the splenomegaly, the serum had the appearance of rich milk. Blood samples taken on several different days all appeared the same. Examination of the eyegrounds showed the fundi to be normal except that the vessels seemed to be full of milk rather than blood. Several basal metabolism determinations all gave results within the normal range. The Wassermann, Kahn, and Mantoux tests were negative. Roentgen ray studies showed slight loss of shadow-casting material in the long bones and no chest abnormalities. The abdominal roentgenograms showed the slightly enlarged liver and the considerably enlarged spleen. Galactose tolerance test of liver function gave no evidence of hepatic damage. The extent of the anomaly, indicated by examination and previous medical history, initiated intensive study of the patient in an attempt to ascertain the cause of the lipemia and evolve dietary or medical treatment which would afford the best prognosis for recovery.

TABLE 562

Lipemia (R.B.)  
77 months

SPECIFIC DYNAMIC RESPONSE

AFTER FAT MEAL*			AFTER CARBOHYDRATE MEAL†		
	R.Q.	Calories		R.Q.	Calories
Basal requirement per 24 hours‡	.82	998	Basal requirement per 24 hours‡	.79	996
1 hour after fat meal	.82	1076	1 hour after carbohydrate meal	.84	1085
2 hours after fat meal	.80	1114	2 hours after carbohydrate meal	.85	1156
3 hours after fat meal	.75	1088	3 hours after carbohydrate meal	.86	1097
4 hours after fat meal	.76	1082	4 hours after carbohydrate meal	.78	1033

\* One hundred milliliters of 20 per cent cream, 20 gm. butter, 10-15 gm. toast.  
† Thirty grams glucose in 100 ml. lemonade ( $\frac{1}{2}$  water).  
‡ Average of 2 lowest of 3 fasting determinations.

TABLE 563

Lipemia (R.B.)  
77 months

FAT PARTITION OF FECES  
*Values in grams per day*

Date	Total fat	Nonsaponifiable	Neutral fat	Free fatty acid	Soap
8-26	1.11	0.31	0.19	0.23	0.38
8-29	1.09	0.09	0.23	0.25	0.52
9-1	2.83	0.53	0.42	0.52	1.36
9-4	0.67	0.11	0.13	0.13	0.30

TABLE 564

Lipemia (R.B.)

GLUCOSE TOLERANCE TESTS  
*Values are milligrams per 100 milliliters*

Age	Blood Sugar	
	68 months	82 months
Fasting	91	54
One-half hour*	250	100
One hour*	175	82
Two hours*	103	49
Three hours*	90	82

\* After administration of 2 gm. of glucose per kilogram of body weight.



TABLE 565

Lipemia (R.B.)  
77 months

## FOOD INTAKE DURING STUDY

*Values in grams per day*

FOOD	Low fat	High fat	FOOD	Low fat	High fat
	8-26 to 8-31	9-1 to 9-6		8-26 to 8-31	9-1 to 9-6
Bacon	—	15	Egg, poached	1*	—
Banana	100	—	Egg, hard boiled	1*	1*
Beef, lean ground	32	—	Egg, scrambled	—	1*
Beef, broiled	—	59	Jelly, currant	52	—
Bread	54	—	Lettuce, leaf	1†	1†
Butter	—	36	Milk, skim	500	—
Cabbage, boiled	—	70	Milk, whole	—	130
Cantaloupe	100	60	Orange juice	150	—
Carrots, boiled	100	—	Potato, boiled	100	—
Cheese, Cottage	—	26	Sugar	30	—
Corn flakes	20	—	Tomato, sliced	100	60
Cream, 20 per cent	—	180	Watermelon	—	70

\* One egg.

† One leaf

TABLE 566

Lipemia (R.B.)  
77 months

## BLOOD LIPID ANALYSES ON VARIOUS DIETS

	Control	Low fat	High fat	AFTER LOW-FAT DIET AT HOME	
				1 month	10 months
Plasma (mg. per 100 ml.)					
Total lipid	4253	3159	9370	3394	2081
Phospholipid	516	436	833	495	305
Neutral fat	3196	2166	7636	2473	1461
Free cholesterol	175	129	199	120	180
Cholesterol esters	366	428	702	306	135
Erythrocytes (mg. per 100 gm.)					
Total lipid	761	647	930	829	475
Phospholipid	485	481	388	420	283
Neutral fat	168	51	447	251	98
Free cholesterol	101	95	80	80	94
Cholesterol esters	7	20	15	78	0



TABLE 567

Lipemia (R.B.)  
77 monthsNITROGEN AND NEGATIVE MINERALS IN INTAKE, URINE, FECES  
*Values are averages per day*

Date	NITROGEN			PHOSPHORUS			CHLORINE			SULFUR		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
8-26	7.22	5.40	0.77	840	409	296	1530	1128	10	585	451	67
8-29	7.22	6.13	1.33	840	483	394	1530	1692	16	585	495	105
9-1	6.48	7.90	0.70	691	598	425	1536	1601	16	483	674	62
9-4	6.48	8.15	0.30	691	572	140	1536	2064	7	483	610	27

TABLE 568

Lipemia (R.B.)  
77 monthsPOSITIVE MINERALS IN INTAKE, URINE, FECES  
*Values are averages per day*

Date	CALCIUM			MAGNESIUM			SODIUM			POTASSIUM		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
8-26	713	10	531	214	64	105	903	651	11	3129	1480	258
8-29	713	18	587	214	71	111	903	953	77	3129	2080	392
9-1	535	43	669	115	82	90	1137	1282	12	1639	1483	350
9-4	535	98	221	115	65	35	1137	1316	5	1639	1084	112

TABLE 569

Lipemia (R.B.)

SKELETAL MATURATION  
*Values in months*

Chrono- logical age	HAND				FOOT	ELBOW	KNEE	HIP	SHOULDER	AVERAGE
	B.B.G.*	Flory†	Kelly‡	Todd§	Todd§	Todd§	Todd§	Todd§	Todd§	Todd§
101	81	56	81	85	81	83	85	87	81	84

\* Baldwin, B. T., Busby, L. M., Garside, H. V. Anatomic growth of children. University of Iowa Studies in Child Welfare, vol. 4, no. 1, 1928.

† Flory, C. D. Osseous development in the hand as an index of skeletal development. Monographs of the Society for Research in Child Development, vol. 1, no. 3, 1936.

‡ Kelly, H. J. Anatomic age and its relation to stature. University of Iowa Studies in Child Welfare, vol. 12, no. 5, 1937.

§ Determined by T. Wingate Todd and C. C. Francis, Western Reserve University, Cleveland.

TABLE 570

Lipemia (R.B.)

77 months

## NITROGEN PARTITION OF URINE

*Values in grams of nitrogen per day*

Date	Total nitrogen	Urea	Ammonia	Creatinine + creatine	Creatinine	Uric acid
8-26	5.82	4.98	0.227	0.171	0.120	0.116
8-27	3.69	3.30	0.154	0.110	0.088	0.060
8-28	6.69	6.06	0.248	0.200	0.137	0.111
8-29	6.51	5.98	0.246	0.200	0.138	0.121
8-30	5.14	4.57	0.186	0.164	0.115	0.090
8-31	6.74	5.77	0.218	0.206	0.138	0.112
9-1	6.98	6.10	0.214	0.245	0.157	0.096
9-2	8.47	7.90	0.274	0.298	0.156	0.067
9-3	8.25	7.50	0.376	0.277	0.146	0.069
9-4	9.06	7.94	0.698	0.266	0.129	0.073
9-5	8.04	6.30	0.578	0.260	0.138	0.103
9-6	7.35	5.87	0.496	0.224	0.125	0.053

TABLE 571

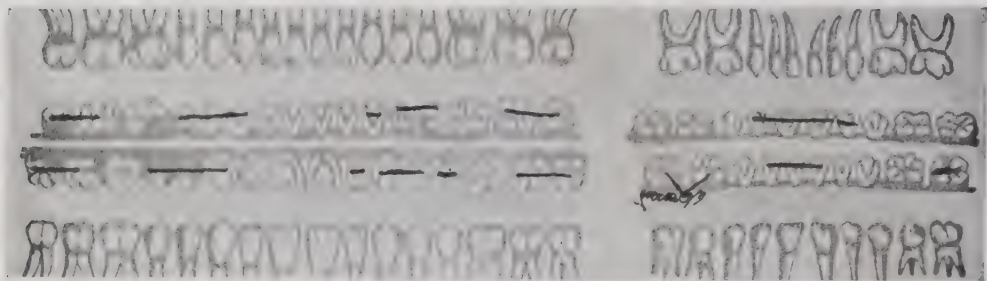
Lipemia (R.B.)

102 months

## BLOOD DETERMINATIONS

Red cells, millions	4.92	Monocytes, per cent	2
Hemoglobin, * gm./100 ml.	13.3	Hemohistioblast, per cent	1
Hematocrit, per cent	38	Minerals, mg. per 100 ml.	
Corpuscular measurements:		Serum:	
Volume, c. $\mu$	78	Calcium	10.8
Weight, $\mu$ g.	2	Phosphorus	4.78
Diameter, $\mu$	7.1	Sodium	293
Thickness, $\mu$	2.0	Potassium	20.9
White cells	4800	Chlorine	322
Polymorphonuclears, per cent	84	Erythrocytes:	
Large lymphocytes, per cent	10	Sodium	13
Small lymphocytes, per cent	16	Potassium	357
Basophiles, per cent	0	Chlorine	139
Eosinophils, per cent	0		

\* Evelyn photoelectric colorimeter.



LIPEMIA (R.B.)  
FIGURE 764. Dental examination, age 102 months.

TABLE 572

Lipemia (R.B.)  
102 months

SALIVA CULTURE ESTIMATION OF CARIES ACTIVITY

Date	QUANTITATIVE*			QUALITATIVE†	COLOR REACTION TEST‡ hours after preparation			
	Lacto- bacilli	Cocci	Yeast		24	48	72	96
	colonies per ml. of saliva							
9-22	57,600	0	0	+	0	3	4	4
10-23	12,000	0	0	+	0	4	4	4
10-31	68,000	0	0	+	0	4	4	4
11-7	50,000	0	300	+	0	4	4	4
11-14	60,000	0	140	+	0	4	4	4

\* 0.2 ml. saliva to tomato agar plate.  
† 1.0 ml. saliva in acid glucose broth.  
‡ 0.2 ml. saliva into melted beef agar.

TABLE 573

Lipemia (R.B.)  
102 months

## FOOD INTAKE DURING THE STUDY

*Values in grams per day*

Apple	100	Cheese	20	Orange juice	100
Banana	150	Corn flakes	30	Peanut butter	16
Beef, lean	100	Egg	100	Peas, frozen	25
Bread, white	50	Gelatin	3	Tomato juice	60
Bread, whl. wht.	50	Graham cracker	36	Salt	2
Butter	30	Honey	15	Potatoes	60
Cabbage	25	Lettuce	25	Sugar (av.)	14
Carrot	50	Milk	500	Water (av.)	449

TABLE 574

Lipemia (R.B.)  
102 months

## BODY LENGTH AND WEIGHT—INTAKE AND ELIMINATION

Date	Recumbent length*	Wt.*	INTAKE			AVERAGE DAILY HEAT OF COMBUSTION			FECES				
			AVERAGE DAILY			Intake	Urine	Feces	AVERAGE DAILY			Laxation rate§	Elimination time
			Dry weight†	Total water‡	Fat				Wet weight	Dry weight†	Fat		
mo.-day	cm.	kg.	gm.	gm.	gm.	Cal.	Cal.	Cal.	gm.	gm.	gm.		hr.
9-18	120	24.02	402	1626	78.5	2055	86	116	130.8	25.4	2.8	1.8	26
9-23	120	23.70	401	1650	80.5	2059	88	116	131.2	25.4	3.0	2.0	12
9-28	120	24.06	434	1528	88.1	2230	86	116	130.6	25.8	2.9	1.8	13
10-3	120	24.04	406	1740	83.4	2083	89	107	119.8	23.9	2.7	1.4	36
10-8	120	24.20	420	1723	84.2	2140	83	114	125.2	24.4	3.2	1.4	30
10-13	120	24.30	403	1596	83.0	2082	89	102	95.2	22.1	3.2	1.4	11
10-18	120	24.49	464	1556	84.2	2327	85	108	109.4	23.3	3.3	1.4	11
10-23	120	24.81	459	1490	83.0	2309	90	119	138.8	25.5	3.2	1.8	9
10-28	120	24.80	424	1515	80.5	2136	90	116	111.2	25.0	3.0	1.2	12
11-2	121	24.86	402	1599	82.7	2087	85	126	118.0	27.0	3.6	1.2	11
11-7	121	24.98	424	1455	82.1	2159	87	117	138.0	25.4	3.4	1.4	8

The age given is the initial age at start of study. Dates given are first days of 5-day balance periods.

\* See Table 583 for actual values and method of smoothing.

† Based on vacuum-dried food and cryochem-dried feces. Corresponding values for alcohol-dried food and oven-dried feces are given in Table 597, page 1421.

‡ Drinking water plus water in food calculated on the basis of vacuum dried dry weight of intake.

§ Average number of defecations per day.

|| Elapsed time between ingestion and defecation of marker used to separate feces of 5-day periods.

TABLE 575

Lipemia (R.B.)  
102 monthsNITROGEN AND NEGATIVE MINERALS IN INTAKE, URINE, FECES  
*Values are averages per day*

Date	NITROGEN			PHOSPHORUS			CHLORINE			SULFUR		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	gm.	gm.	gm.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
9-18	12.69	11.10	1.46	1437	827	543	4403	4284	50	984	772	135
9-23	12.47	11.03	1.58	1455	766	606	4325	4015	49	933	746	138
9-28	13.05	10.55	1.54	1432	762	490	4376	3984	46	1011	702	146
10-3	13.54	11.06	1.41	1488	751	505	4312	4122	41	965	779	134
10-8	12.86	10.79	1.49	1429	782	537	4141	3954	50	1032	728	137
10-13	13.18	11.23	1.25	1492	823	482	4270	4080	25	868	748	120
10-18	13.05	10.98	1.35	1492	790	554	4471	4020	36	1006	762	125
10-23	13.45	11.18	1.48	1494	852	552	4414	4124	52	1058	768	134
10-28	13.14	10.72	1.50	1413	842	507	4275	4094	45	924	750	140
11-2	13.26	11.24	1.40	1450	870	515	4426	4128	44	944	776	146
11-7	13.00	10.92	1.43	1522	836	523	4315	4216	46	983	743	136

TABLE 576

Lipemia (R.B.)  
102 monthsPOSITIVE MINERALS IN INTAKE, URINE, FECES  
*Values are averages per day*

Date	CALCIUM			MAGNESIUM			SODIUM			POTASSIUM		
	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces	Intake	Urine	Feces
mo.-day	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
9-18	928	37	639	284	102	160	3032	2836	67	3256	2445	503
9-23	961	38	817	299	90	180	2966	2762	36	3170	2424	601
9-28	914	39	790	277	24	175	3053	2677	32	3176	2372	519
10-3	944	34	680	305	51	161	3043	2834	18	3252	2367	499
10-8	907	38	782	282	64	171	2950	2674	44	3252	2383	510
10-13	940	43	683	305	86	149	3052	2762	14	3268	2496	394
10-18	933	36	780	294	92	183	3002	2690	16	3266	2498	489
10-23	944	47	814	293	99	198	2974	2685	32	3293	2565	545
10-28	932	44	756	281	105	175	3008	2822	41	3230	2594	504
11-2	961	40	734	284	115	161	2980	2758	33	3277	2596	482
11-7	995	43	794	296	114	164	2909	2806	49	3332	2512	504



TABLE 577

Lipemia (R.B.)  
102 months

## COMPLEX CARBOHYDRATES IN INTAKE AND FECES

*Values in grams per day*

Date	LIGNIN		CELLULOSE		HEMICELLULOSE		
	Intake	Feces	Intake	Feces	INTAKE		
					Total	Stable	Feces
9-18	1.25	1.43	2.74	0.99	2.80	1.61	0.85
9-23	1.25	1.38	2.74	1.30	2.80	1.61	0.73
9-28	1.25	1.48	2.74	1.39	2.80	1.61	0.78
10-3	1.25	1.78	2.74	1.21	2.80	1.61	1.09
10-8	1.25	1.24	2.74	1.04	2.80	1.61	0.68
10-13	1.25	1.47	2.74	0.82	2.80	1.61	0.69
10-18	1.25	1.37	2.74	1.35	2.80	1.61	0.73
10-23	1.25	1.53	2.74	1.51	2.80	1.61	0.92
10-28	1.25	2.03	2.74	1.47	2.80	1.61	0.80
11-2	1.25	1.92	2.74	1.70	2.80	1.61	0.92
11-7	1.25	1.49	2.74	1.26	2.80	1.61	0.72

TABLE 578

Lipemia (R.B.)  
102 months

## FAT PARTITION OF FECES

*Values in grams per day*

Date	Unsaponi- fiable	Neutral fat	Free fatty acid	Soap
9-18	0.80	0.15	0.25	1.57
9-23	0.84	0.25	0.36	1.60
9-28	0.90	0.12	0.28	1.59
10-3	0.88	0.21	0.29	1.32
10-8	0.98	0.37	0.47	1.33
10-13	0.91	0.26	0.31	1.70
10-18	1.00	0.23	0.34	1.74
10-23	0.99	0.22	0.35	1.68
10-28	0.97	0.22	0.32	1.49
11-2	0.97	0.39	0.36	1.87
11-7	1.01	0.30	0.35	1.79

TABLE 579

Lipemia (R.B.)  
102 months

## URINE VOLUME, WEIGHT AND SULFUR PARTITION

*Values are averages per day*

Date	Vol- ume	Specific gravity	Wet weight	Dry weight	SULFUR PARTITION		
					In- organic	Ethe- real	Neu- tral
mo.-day	ml.		gm.	gm.	mg.	mg.	mg.
9-18	763	1.028	785	45.5	—	—	—
9-23	676	1.030	696	45.6	—	—	—
9-28	669	1.031	690	43.7	634	34	34
10-3	678	1.031	699	42.7	672	38	69
10-8	672	1.040	699	40.9	656	34	38
10-13	751	1.036	778	44.3	662	41	45
10-18	712	1.049	747	42.7	664	66	32
10-23	766	1.038	795	45.6	660	39	69
10-28	782	1.033	808	45.7	635	46	69
11-2	836	1.036	866	45.2	664	44	68
11-7	793	1.041	826	45.7	652	44	47

TABLE 580

Lipemia (R.B.)  
102 months

## ACIDITY, pH, AND ORGANIC ACID OF URINE

*Values in milliequivalents per day*

Date	Titrate acidity	pH	Total organic acid	Date	Titrate acidity	pH	Total organic acid
9-18	13.9	6.38	26.8	10-16	12.7	6.64	26.5
9-19	18.0	6.09	26.4	10-17	8.2	7.25	27.3
9-20	21.9	5.99	29.0	10-18	11.9	7.13	25.4
9-21	13.4	6.59	22.9	10-19	3.8	7.22	26.9
9-22	23.6	5.70	24.6	10-20	7.0	7.39	27.2
9-23	16.7	6.33	29.1	10-21	7.0	6.80	26.0
9-24	13.2	6.37	22.8	10-22	4.0	6.96	24.8
9-25	9.6	6.44	24.6	10-23	11.4	6.91	25.9
9-26	4.8	6.80	20.0	10-24	16.5	6.40	27.6
9-27	21.1	6.11	31.4	10-25	16.1	6.42	25.2
9-28	15.9	6.18	25.9	10-26	11.4	6.62	26.0
9-29	10.4	6.20	26.6	10-27	13.6	6.59	29.0
9-30	8.8	6.60	24.0	10-28	9.8	6.68	26.2
10-1	11.0	7.50	23.0	10-29	13.4	6.43	21.8
10-2	1.6	7.22	27.4	10-30	17.6	6.21	25.6
10-3	7.2	7.01	24.6	10-31	15.3	6.47	26.0
10-4	2.8	7.30	25.2	11-1	10.5	6.61	25.6
10-5	3.6	7.50	27.6	11-2	18.0	6.17	23.3
10-6	3.2	6.90	26.6	11-3	15.6	6.20	27.2
10-7	1.4	7.22	29.0	11-4	14.0	6.58	26.4
10-8	3.0	7.40	26.8	11-5	9.6	6.62	26.4
10-9	0.6	6.74	29.4	11-6	15.5	6.38	23.4
10-10	1.6	7.63	28.0	11-7	13.6	6.44	24.2
10-11	2.2	7.60	29.6	11-8	15.1	5.62	21.7
10-12	5.0	7.62	29.2	11-9	14.7	6.28	25.0
10-13	16.8	6.54	25.6	11-10	13.8	6.49	25.5
10-14	7.9	6.84	25.2	11-11	15.4	6.38	23.9
10-15	12.5	6.93	24.0				

## NITROGEN PARTITION OF URINE

*Values in grams of nitrogen per day*

Date	Urine volume*	Total nitrogen	Urea	Am- monia	Creatinine + creatine	Creatinine	Uric acid
9-18	790	10.662	9.232	0.358	0.283	0.186	0.140
9-19	760	11.225	9.620	0.376	0.341	0.185	0.105
9-20	765	11.252	10.011	0.379	0.307	0.200	0.144
9-21	795	10.991	9.706	0.326	0.299	0.187	0.152
9-22	705	11.248	9.814	0.366	0.292	0.173	0.140
9-23	696	11.678	10.380	0.323	0.291	0.206	0.163
9-24	647	11.090	9.737	0.353	0.283	0.188	0.136
9-25	683	10.689	8.821	0.319	0.289	0.193	0.149
9-26	617	8.780	7.267	0.223	0.256	0.157	0.139
9-27	738	12.870	11.484	0.466	0.329	0.244	0.157
9-28	660	10.686	9.391	0.389	0.259	0.191	0.148
9-29	638	10.676	9.291	0.309	0.299	0.200	0.120
9-30	708	10.406	8.953	0.317	0.289	0.208	0.106
10-1	718	10.478	9.019	0.541	0.268	0.175	0.115
10-2	620	10.364	8.518	0.422	0.313	0.205	0.129
10-3	682	10.262	8.907	0.473	0.322	0.196	0.116
10-4	610	11.033	9.526	0.534	0.308	0.199	0.131
10-5	625	11.211	9.607	0.623	0.312	0.187	0.132
10-6	700	11.364	9.695	0.655	0.329	0.192	0.128
10-7	772	11.433	9.977	0.543	0.329	0.216	0.115
10-8	585	10.367	8.765	0.685	0.320	0.201	0.130
10-9	650	10.638	9.104	0.676	0.329	0.187	0.129
10-10	622	10.784	9.124	0.746	0.298	0.166	0.119
10-11	708	11.166	9.526	0.694	0.318	0.192	0.127
10-12	797	11.152	9.547	0.693	0.313	0.186	0.124
10-13	787	11.880	10.552	0.378	0.327	0.201	0.122
10-14	730	11.130	9.976	0.294	0.288	0.178	0.117
10-15	711	10.904	9.274	0.476	0.295	0.176	0.117
10-16	752	10.810	9.515	0.365	0.278	0.208	0.099
10-17	775	11.438	9.979	0.481	0.243	0.183	0.121
10-18	662	10.686	9.496	0.444	0.257	0.177	0.120
10-19	682	11.376	10.114	0.566	0.289	0.182	0.118
10-20	680	10.472	9.106	0.414	0.307	0.192	0.116
10-21	755	11.346	10.007	0.443	0.299	0.196	0.127
10-22	780	11.262	9.242	0.488	0.315	0.201	0.124
10-23	737	11.252	10.016	0.454	0.320	0.204	0.119
10-24	775	10.785	9.414	0.376	0.296	0.197	0.121
10-25	743	11.171	9.790	0.400	0.300	0.185	0.137
10-26	910	11.502	9.968	0.364	0.368	0.229	0.136
10-27	665	11.261	9.914	0.366	0.331	0.208	0.133
10-28	785	10.776	9.364	0.356	0.318	0.188	0.120
10-29	680	10.341	8.934	0.346	0.286	0.208	0.113
10-30	738	10.488	9.054	0.346	0.304	0.196	0.138
10-31	847	10.932	9.596	0.334	0.322	0.200	0.124
11-1	860	10.996	9.566	0.312	0.331	0.191	0.130
11-2	790	11.282	9.878	0.363	0.306	0.193	0.125
11-3	925	11.575	10.148	0.340	0.352	0.219	0.137
11-4	800	11.114	9.726	0.304	0.305	0.208	0.114
11-5	800	11.360	9.926	0.314	0.315	0.200	0.123
11-6	865	10.914	9.083	0.355	0.364	0.197	0.126
11-7	892	10.580	9.301	0.364	0.299	0.180	0.126
11-8	710	10.896	8.922	0.328	0.290	0.192	0.118
11-9	737	10.986	9.826	0.324	0.324	0.186	0.121
11-10	783	10.858	9.692	0.318	0.313	0.196	0.121
11-11	843	11.178	10.057	0.313	0.292	0.182	0.125

\* Values in milliliters.

TABLE 582

Lipemia (R.B.)  
102 monthsIRON, MANGANESE, COPPER, ALUMINUM, LEAD  
AND TIN IN INTAKE, FECES\**Values in milligrams per day*

Date	IRON		MANGANESE		COPPER	
	Intake	Feces	Intake	Feces	Intake	Feces
9-18	10.94	—	2.00	—	2.64	—
9-23	10.28	—	1.82	—	2.22	—
9-28	9.80	9.69	2.22	1.66	4.24	1.90
10-3	12.53	8.65	1.98	1.51	3.65	1.73
10-8	14.04	10.57	2.22	1.76	3.52	2.11
10-13	11.49	9.46	2.12	1.72	3.50	1.51
10-18	12.18	—	2.14	—	6.11	—
10-23	12.48	10.15	2.18	1.81	4.14	1.85
10-28	11.05	—	2.13	—	4.60	—
11-2	10.26	—	1.76	—	2.38	—
11-7	9.03	9.10	1.77	1.68	2.76	1.75

	ALUMINUM		LEAD		TIN	
	Intake	Feces	Intake	Feces	Intake	Feces
9-18	4.40	—	0.58	—	1.33	—
9-23	3.80	—	0.56	—	1.52	—
9-28	2.85	2.32	0.52	0.32	1.79	1.41
10-3	3.38	1.57	0.52	0.35	3.32	2.15
10-8	2.43	2.04	0.62	0.39	1.54	1.90
10-13	1.98	1.12	0.45	0.30	0.92	1.09
10-18	3.50	—	0.67	—	0.77	—
10-23	2.71	1.41	0.62	0.36	0.72	0.87
10-28	3.02	—	0.52	—	0.70	—
11-2	3.24	—	0.66	—	0.75	—
11-7	2.14	1.61	0.52	0.38	0.76	0.73

\* Determined spectrographically by the method of Brody, James K. and Ewing, D. T. Spectrographic determination of some metallic elements in food and feces. *Indus. Engin. Chem. (Anal. Ed.)* 17: 627, 1945.

TABLE 583

Lipemia (R.B.)  
102 months

## RECUMBENT LENGTH AND WEIGHT

Date	Recumbent length		Weight	Date	Recumbent length		Weight
	Total	Stem			Total	Stem	
mo.-day	cm.	cm.	kg.	mo.-day	cm.	cm.	kg.
9-18	—	—	24.02	10-24	—	—	24.81
9-23	—	—	23.70	10-28	—	—	24.80
9-30	—	—	24.06	11-2	—	—	24.86
10-4	119.9	66.4	24.04				
10-7	120.4	67.4	—	11-8	120.6	67.9	24.98
10-9	120.4	67.2	24.20	11-9	120.0	67.6	—
				11-10	120.4	67.5	—
10-11	120.4	67.2	—	11-12	121.0	68.0	—
10-13	120.0	66.7	24.30	11-13	120.8	67.8	—
10-18	—	—	24.49	11-14	—	—	25.00

TABLE 584

Lipemia (R.B.)  
102 months

## ANTHROPOMETRIC MEASUREMENTS

*Values in centimeters*

Date	BREADTH		LENGTH		WIDTH	
	Biocro- mial	Inter- cristal	Tibia	Head	Chest	Head
9-16	23.4	20.0	25.4	19.3	20.4	14.2
10-20	24.0	20.1	26.0	19.3	20.5	14.2
11-11	24.0	20.5	25.7	19.2	20.3	14.1
Date	DEPTH	CIRCUMFERENCES				
	Chest	Head	Chest	Thigh	Abdomen	Upper arm
9-16	15.3	53.0	62	33	61	16.0
10-20	14.8	52.8	62	34	58	16.3
11-11	16.0	54.3	63	34	61	16.0

TABLE 585

Lipemia (R.B.)  
102 months

## BASAL METABOLISM MEASUREMENTS

Date	Sur- face area*	Respira- tion	Pulse rate	Body temper- ature	Blood pressure	Basal metabo- lism
mo.-day	sq.m.	per min.	per min.	°F	S/D†	Cal./24 hrs.
9-21	0.88	36	72	99.0	80/?	1258
9-22	0.88	34	64	98.1	70/?	1276
10-31	0.92	31	70	98.8	78/56	1375
11-1	0.93	18	74	98.6	78/52	1280

\* DuBois formula.

† Systolic/Diastolic.



TABLE 586  
Lipemia (R.B.)  
MEASUREMENTS OF THE BONES OF THE WRIST

AGE, months	101	AGE, months	101
CARPALS		CARPALS	
AREA, sq. mm.		GREATEST DIAMETER, mm.	
Hamate	80	Hamate	12
Capitate	122	Capitate	16
Lesser Multangular	22	Lesser Multangular	6
Greater Multangular	10	Greater Multangular	4
Navicular	18	Navicular	6
Lunate	23	Lunate	7
Triangular	40	Triangular	8
ULNA		Epiphyses	
DIAMETER, mm.		1st Metacarpal	7
Distal epiphysis	0	2nd Metacarpal	9
Distal metaphysis	13	3rd Metacarpal	9
RADIUS		4th Metacarpal	7
DIAMETER, mm.		WRIST AREA,* sq. mm.	1094
Distal epiphysis	21		

\* Measured with the planimeter using Flory's landmarks (Monographs of the Society for Research in Child Development, Vol. I, No. 3, 1936).

TABLE 587  
Lipemia (R.B.)  
102 months

CARBON IN INTAKE, URINE, FECES

Date	CARBON			Date	CARBON		
	Intake	Urine	Feces		Intake	Urine	Feces
mo.-day	gm.	gm.	gm.	mo.-day	gm.	gm.	gm.
9-18	189.8	7.9	10.4	10-18	189.8	8.7	9.9
9-23	189.8	8.4	11.0	10-23	189.8	8.6	10.6
9-28	189.8	7.6	10.7	10-28	189.8	8.5	10.7
10-3	189.8	7.6	9.8				
10-8	189.8	7.6	10.2	11-2	189.8	8.2	11.2
10-13	189.8	8.0	9.5	11-7	189.8	8.3	10.6



## LIPEMIA (R.B.)

FIGURE 765. Actual size reproduction of roentgenogram of left hand.  
Chronological age 101 months.



## LIPEMIA (R.B.)

FIGURE 766. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 101 months.



## LIPEMIA (R.B.)

FIGURE 767. Actual size reproduction of roentgenogram of left elbow.  
Chronological age 101 months.



## LIPEMIA (R.B.)

FIGURE 768. Actual size reproduction of roentgenogram of left shoulder.  
Chronological age 101 months.





## LIPEMIA (R.B.)

FIGURE 769. Actual size reproduction of roentgenogram of left knee.  
Chronological age 101 months.



LIPEMIA (R.B.)

FIGURE 770. Actual size reproduction of roentgenogram of left hip.  
Chronological age 101 months.



## LIPEMIA (R.B.)

FIGURE 771. Actual size reproduction of roentgenogram of left knee.  
Chronological age 101 months.



LIPEMIA (R.B.)

FIGURE 772. Actual size reproduction of roentgenogram of left foot.  
Chronological age 101 months.



LIPEMIA (R.B.)

FIGURE 773. Actual size reproduction of roentgenogram of left foot.  
Chronological age 101 months.



## HEMATOCHEMICAL STUDIES OF THE BLOOD IN HEALTH AND DISEASE

Concurrent with the studies of nutrition and chemical growth in childhood, the Laboratory has carried on extensive hematochemical investigations with normal and ill women and children. The data obtained with normal children provide an opportunity for comparison among three groups of children, representative of subjects commonly used as "controls" in experimental studies. The data on normal children are reprinted by courtesy of *The Journal of Biological Chemistry*.\*

The children in Group 1 were subjects of the studies of nutrition and chemical growth in childhood. They had been chosen because of a known clean health record and no detectable hereditary defects. The excellence of their nutritive state was confirmed by careful medical examinations, anthropometric measurements and detailed study of their bone development. At the time the blood samples were taken these children were as well standardized as is possible in human subjects, because they had been on a controlled, fixed dietary regimen for the preceding 8 months, during which time they had made excellent progress in growth and development.

The children in Group 2 had approximately the same environment as Group 1, with the exception that their diet was not controlled and they had not received the close supervision demanded by a metabolic study. Their bone development and health record were average, but more variable than those of the controlled group.

Group 3 consisted of five children, between the ages of 5 months and 5 years, who were patients in the Children's Hospital of Michigan. These children had received treatment for various disorders such as burns, dislocations, and infections, but were considered normal from a clinical and hematological standpoint. However, in view of their past medical history with respect to infection and the possibility of suboptimal nutrition, inasmuch as they were of an indigent class and lower age range, they were considered independently of Groups 1 and 2.

\* Erickson, Betty Nims, Harold H. Williams, Frances Cope Hummel, and Icie G. Macy. The lipid and mineral distribution in the serum and erythrocytes of normal children. *J. Biol. Chem.* 118: 15, 1937.

TABLE 588

## Normal Blood

BLOOD SODIUM, POTASSIUM, AND CHLORIDE  
OF NORMAL CHILDREN

Subject	Sex	Age	SERUM			ERYTHROCYTE			CORPUSCLE*		
			Sodium	Potas- sium	Chlo- ride	Sodium	Potas- sium	Chlo- ride	Sodium	Potas- sium	Chlo- ride
		mo.	mg./ 100 ml.	mg./ 100 ml.	mg./ 100 ml.	mg./ 100 ml.	mg./ 100 ml.	mg./ 100 ml.	×10 <sup>-12</sup> mg.	×10 <sup>-12</sup> mg.	×10 <sup>-12</sup> mg.
Group 1											
Jimmy		63	317	16	359	34	502	181	28	414	149
Barbara		71	328	15	364	26	468	176	23	414	156
Bobby		73	319	17	351	44	478	182	46	477	184
Betty		75	316	16	371	33	490	153	30	457	160
Jean		80	320	16	390	40	500	236	34	430	202
Frank		86	310	14	364	63	436	210	55	391	170
Herbert		91	299	15	344	48	459	205	44	406	181
Average			316	16	363	41	476	192	37	427	172
Group 2											
R.O.	M	58	333	16	372	37	438	170	23	293	113
C.S.	M	97	338	16	386	46	426	206	37	352	170
B.O.	M	76	336	16	383	37	399	160	30	320	131
F.C.	M	78	338	16	393	42	452	179	34	364	142
G.S.	M	87	338	16	376	9	450	188	9	418	174
C.M.	M	90	326	16	340	23	391	124	16	313	99
L.S.	F	97	333	16	369	34	430	195	25	320	145
D.P.	M	98	335	14	380	49	392	136	41	328	113
C.S.	F	101	324	20	362	53	414	202	46	364	177
P.O.	M	104	329	20	344	28	410	160	23	344	135
P.O.	M	109	320	16	358	32	555	291	28	485	255
Average			332	16	369	35	432	183	28	355	150

\* Represents the concentration in an average single red blood cell.

TABLE 589 Normal Blood  
HEMATOLOGICAL OBSERVATIONS ON NORMAL CHILDREN

Subject	Sex	Age	RED CELLS		HEMOGLOBIN		Hematocrit
			Whole blood	Per gm. cells	Whole blood	Cells	

Group 1							
		months	millions	$\times 10^{10}$	gm. per 100 ml.	micro-micro-grams	per cent
Jimmy		63	4.78	1.11	12	25	40
Barbara		71	4.76	1.03	12	25	42
Bobby		73	4.39	0.93	12	27	42
Betty		75	4.55	1.04	12	26	40
Jean		80	4.81	1.07	12	25	42
Frank		86	4.15	1.03	11	27	37
Herbert		91	4.71	1.03	13	28	42
Donald		106	4.38	1.14	12	27	35
Average			4.57	1.05	12	26	40

Group 2							
R.O.	M.	58	5.83	1.37	14	23	39
C.S.	M.	97	5.39	1.12	13	24	44
C.S.	M.	101	5.21	1.04	15	29	46
B.O.	M.	76	5.07	1.14	13	25	41
F.C.	M.	78	4.47	1.15	11	25	36
G.S.	M.	87	4.23	0.99	12	27	39
G.S.	M.	89	4.72	1.06	14	30	41
C.M.	M.	90	5.12	1.15	14	27	41
I.S.	F.	97	5.74	1.22	15	26	43
D.P.	M.	98	4.40	1.10	12	26	37
P.O.	M.	104	4.77	1.09	14	29	40
P.O.	M.	109	4.48	1.07	13	29	39
M.W.	M.	107	4.74	1.04	15	32	42
Average			4.94	1.12	13	27	41

Group 3							
A.A.	M.	5	4.25	1.03	14	33	38
P.N.	F.	24	4.41	1.01	14	32	40
J.S.	M.	25	4.07	0.92	13	31	41
J.D.	F.	60	4.72	1.08	14	30	40
J.L.	M.	60	4.48	1.09	16	37	38
Average			4.39	1.03	14	32	39

TABLE 589

## Normal Blood

## HEMATOLOGICAL OBSERVATIONS ON NORMAL CHILDREN

CORPUSCULAR MEASUREMENTS				Diam-eter thick-ness ratio	Volume thick-ness index	HEMOLYSIS			
Vol-ume	Weight	Diam-eter	Thick-ness			HYPOTONIC NaCl		SAPONIN	
						Begin-ning	Com-plete	Begin-ning	Com-plete
Group 1									
c.μ	micro-micro-grams	μ	μ			per cent	per cent	micro-grams	micro-grams
83	90	7.3	2.0	3.6	1.08				
88	97	7.2	2.2	3.3	1.21				
96	108	7.2	2.4	3.0	1.32				
88	96	7.2	2.2	3.3	1.21				
86	94	7.3	2.1	3.5	1.12				
90	97	7.4	2.0	3.7	1.14				
89	97	7.2	2.2	3.3	1.22				
81	88	7.2	2.0	3.5	1.11				
88	96	7.3	2.1	3.4	1.17				
Group 2									
67	73	7.4	1.6	4.6	0.85	0.38	0.26	10	56
82	89								
88	96	7.1	2.2	3.2	1.25	0.42	0.26		
81	88	7.5	1.8	4.2	0.98	0.36	0.24	10	58
80	87					0.38	0.24	10	53
93	101	7.4	2.2	3.4	1.17	0.42	0.30	10	52
87	95	7.0	2.0	3.5	1.29	0.40	0.26		
80	87	7.1	2.1	3.4	1.14	0.42	0.28		
75	82	7.0	2.0	3.5	1.11	0.42	0.26		
84	91	7.2	2.1	3.4	1.15	0.40	0.32	9	50
84	92	7.2	2.0	3.5	1.15	0.40	0.26		
87	94	7.1	2.2	3.2	1.24				
88	96	7.2	2.2	3.3	1.21	0.42	0.26	10	40
83	90	7.2	2.0	3.6	1.14	0.39	0.28	10	52
Group 3									
89	97					0.53	0.30	10	33
91	99					0.50	0.31	10	33
100	109					0.44	0.22	9	33
85	93					0.42	0.32	10	33
84	92					0.44	0.20	8	25
90	98					0.47	0.27	10	32

TABLE 590

Normal Blood

## BLOOD LIPIDS OF NORMAL CHILDREN

Subject	Sex	Age	PLASMA PER 100 M.L.					
			Total lipid	Phospho-lipid	Neutral fat	CHOLESTEROL		
						Total	Free	Esters
Group 1								
		mos.	mg.	mg.	mg.	mg.	mg.	mg.
Jimmy		63	434	142	66	152	45	182
Barbara		71	388	113	93	119	28	154
Bobby		73	358	118	114	82	17	109
Betty		75	495	109	178	140	41	167
Jean		80	606	175	159	177	38	235
Frank		86	474	168	39	170	31	235
Herbert		91	462	158	70	152	34	200
Donald		106	401	144	35	144	31	191
Average			452	141	94	142	33	184
Group 2								
C.S.	M.	101	561	158	174	154	46	182
B.O.	M.	78	488	138	137	143	41	173
G.S.	M.	89	482	147	110	149	38	188
C.M.	M.	90	373	52	139	120	31	150
I.S.	F.	97	521	156	159	139	41	165
P.O.	M.	104	428	154	0	180	45	229
M.W.	M.	107	333	98	45	122	24	166
P.O.	M.	109	459	149	76	152	34	200
Average			456	132	105	145	37	183
Group 3								
A.A.	M.	5	518	140	178	141	56	144
P.N.	F.	24	755	201	170	260	79	305
J.S.	M.	25	804	247	307	172	59	191
J.D.	F.	60	619	210	112	203	67	230
J.L.	M.	60	371	87	141	100	38	105
Average			613	177	182	175	60	194



TABLE 590

Normal Blood

## BLOOD LIPIDS OF NORMAL CHILDREN

ERYTHROCYTES PER 100 GM.						CORPUSCLE*					
Total lipid	Phos-pho-lipid	Neu-tral fat	CHOLESTEROL			Total lipid	Phos-pho-lipid	Neu-tral fat	CHOLESTEROL		
			Total	Free	Esters				Total	Free	Esters
Group 1											
mg.	mg.	mg.	mg.	mg.	mg.	×10 <sup>-12</sup> mg.	×10 <sup>-12</sup> mg.	×10 <sup>-12</sup> mg.	×10 <sup>-12</sup> mg.	×10 <sup>-12</sup> mg.	×10 <sup>-12</sup> mg.
448	271	56	115	104	18	404	244	50	104	94	16
404	233	30	124	99	42	392	226	29	120	97	41
421	247	41	110	77	55	455	267	44	119	83	59
340	191	34	112	108	8	349	196	35	115	111	8
443	239	76	120	109	19	416	224	71	113	103	18
457	259	16	154	114	67	444	252	16	150	111	69
435	256	78	101	99	3	421	248	76	98	96	3
394	239	24	112	82	49	346	210	21	98	72	43
418	241	44	119	99	34	403	233	43	115	96	32
Group 2											
437	254	40	128	109	33	419	244	38	123	106	32
415	198	117	100	100	0						
444	245	67	121	103	29	420	232	63	114	97	27
425	253	15	129	88	69	369	219	13	112	76	60
459	266	73	108	89	32	375	217	60	88	73	17
467	246	114	106	105	2	427	225	104	97	96	2
375	235	23	101	77	40	360	225	22	97	74	38
416	278	13	112	94	31	391	261	12	105	88	29
430	247	58	113	96	29	394	232	45	105	87	30
Group 3											
403	218	25	147	128	32	403	211	24	142	124	31
434	273	16	145	145	0	430	271	16	144	144	0
453	254	69	130	130	0	491	275	75	138	138	0
423	232	21	160	146	23	394	216	20	149	137	21
495	288	62	133	115	30	453	264	57	122	105	27
442	253	39	143	133	17	434	247	38	139	130	15

\* Represents the concentration in an average single red blood cell.

The data on the total platelet and differential counts in hemophilia were included in a published paper and are reprinted by courtesy of *The Journal of Laboratory and Clinical Medicine*.\*

TABLE 591

Hemophilia

## TOTAL PLATELET AND DIFFERENTIAL COUNTS

*All platelet counts expressed in thousands*

Age	Number of counts*	Total platelet range	COUNT NEAREST MEAN†						
			Total	Differential count					
				Group I		Group II		Group III	
					per cent		per cent		per cent
13	3	450-1188	748	524	70	210	28	14	2
7	2	546-640	546	202	37	344	63	0	—
8	2	252-506	252	126	50	101	40	25	10
4	4	991-1157	1013	597	59	416	41	0	—
9	2	944-974	944	604	65	331	35	9	1
13	1	450	450	270	60	166	37	14	3
15	1	414	414	166	40	248	60	0	—
6	2	317-1441	317	101	32	216	68	0	—
8	1	639	639	256	40	377	59	6	1

\* All of the subjects were boys.

† When only two counts were taken, the lowest was used.

\* Lee, Pearl and Betty Nims Erickson. Platelet studies in normal men and women (menstruating and nonmenstruating) and subjects with bleeding disorders. *J. Lab. Clin. Med.* 24: 821, 1939.

The data obtained on the lipid and mineral constitution of the serum and erythrocytes in anemias of childhood are reprinted by courtesy of *The Journal of Biological Chemistry*.\*

TABLE 592

## Anemia

BLOOD SODIUM, POTASSIUM, AND CHLORIDE IN  
HEMOLYTIC AND HYPOCHROMIC ANEMIAS

Observation	Sub- ject*	SERUM			ERYTHROCYTES			CORPUSCLE†			Remarks
		So- dium	Potas- sium	Chlo- ride	So- dium	Potas- sium	Chlo- ride	So- dium	Potas- sium	Chlo- ride	
		mg./ 100 ml.	mg./ 100 ml.	mg./ 100 ml.	mg./ 100 ml.	mg./ 100 ml.	mg./ 100 ml.	×10 <sup>-12</sup> mg.	×10 <sup>-12</sup> mg.	×10 <sup>-12</sup> mg.	
Normal (average of 18 studies)		<b>326</b>	<b>16</b>	<b>369</b>	<b>37</b>	<b>450</b>	<b>188</b>	<b>32</b>	<b>383</b>	<b>160</b>	
Microcytic anemia											
Anemia	A.B.	320	31	383	32	414	142	32	414	142	Severe
	B.D.	310	20	358	64	465	181	53	395	152	Severe
	C.D.	246	12	372	32	371	216	37	418	245	Severe
	C.D.	322	20	365	0	485	117	0	434	110	Severe
	E.D.	304	—	340	28	—	198	23	—	181	Crisis
	R.B.	315	16	376	92	332	138	80	289	120	Severe. Splenectomy 12-8-26
Average		<b>304</b>	<b>20</b>	<b>365</b>	<b>41</b>	<b>414</b>	<b>167</b>	<b>39</b>	<b>391</b>	<b>160</b>	
No anemia	C.W.	308	12	358	32	356	138	25	274	106	
	Z.W.	310	8	362	30	422	198	23	313	149	
	N.B.	336	16	—	4	442	—	4	364	—	
Average		<b>317</b>	<b>12</b>	<b>362</b>	<b>23</b>	<b>406</b>	<b>170</b>	<b>18</b>	<b>317</b>	<b>120</b>	
Erythroblastic anemia											
	M.M.	317	16	390	48	586	163	39	496	135	Severe. Splenectomy 7-11-30
	P.Z.	310	16	358	207	555	177	175	473	152	Crisis
Average		<b>315</b>	<b>16</b>	<b>376</b>	<b>126</b>	<b>571</b>	<b>170</b>	<b>108</b>	<b>481</b>	<b>145</b>	
Hemolytic icterus											
Anemia	H.N.	313	16	365	50	645	184	46	590	170	
Cured	E.H.	301	12	351	2	434	170	2	324	128	Splenectomy 6-21-33
	D.W.	315	16	383	37	438	145	28	317	106	Splenectomy 7-12-33
Average		<b>308</b>	<b>16</b>	<b>365</b>	<b>21</b>	<b>434</b>	<b>160</b>	<b>16</b>	<b>320</b>	<b>117</b>	
Hypochromic anemia											
Before therapy	L.C.	292	31	354	57	406	209	34	250	131	Severe
	G.S.	304	16	376	48	567	188	39	446	149	Severe
	Ri.T.	313	20	372	0	520	181	0	266	92	Severe
Average		<b>306</b>	<b>23</b>	<b>369</b>	<b>34</b>	<b>504</b>	<b>191</b>	<b>25</b>	<b>320</b>	<b>124</b>	
After therapy	L.C.	304	16	372	113	528	195	76	348	128	Slightly subnormal

The figures in bold-faced type are averages except where preceded by a subject designation, in which case a distinct classification within the group is indicated, although reported by a single case.

\* The sequence of date, age, and sex is the same as in Table 593.

† Represents the concentration in an average single red blood cell.

\* Erickson, Betty Nims, Harold H. Williams, Frances Cope Hummel, Pearl Lee and Icie G. Macy. The lipid and mineral distribution of the serum and erythrocytes in the hemolytic and hypochromic anemias of childhood. *J. Biol. Chem.* 118: 569, 1937.

TABLE 593

## Anemia

HEMATOLOGICAL OBSERVATIONS ON HEMOLYTIC  
AND HYPOCHROMIC ANEMIAS OF CHILDHOOD

Observation	Date	Subject	Sex	Age	RED BLOOD CELLS		HEMO-GLOBIN		Hematocrit
					Whole blood	Per gm. cells	Whole blood	Single cells	
				yrs.	millions per c.mm.	$\times 10^{10}$	gm. per 100 cc.	micro-micro-grams	per cent
Normal children (average of 26 studies)					4.7	1.08	13	28	40
Sicklelemlia* Anemia	Apr. 29, 1936	C.D.	F.	5	2.2	0.95	5	26	20
	Mar. 18, 1935	C.D.	F.	4	2.5	0.82	7	28	28
	May 10, 1935	C.D.	F.	4	2.7	1.03	9	35	24
	Oct. 5, 1936	E.D.	M.	5	2.2	1.07	6	30	20
	June 16, 1936	E.D.	M.	5	2.5	1.00	6	26	23
Average	Feb. 18, 1935	A.B.	F.	14	2.0	0.92	7	36	20
	Feb. 28, 1935	B.D.	F.	14	2.6	1.08	7	27	22
	Nov. 22, 1934	J.B.	M.	9	2.7	1.23	9	33	20
	Oct. 6, 1936	E.G.	M.	7	3.4	1.41	8	25	23
					2.5	1.06	7	28	22
Treated by sple- nectomy	Dec. 10, 1934	L.L.	M.	10	2.8	1.24	6	23	21
	Jan. 31, 1935	R.B.	F.	11	2.2	1.05	7	34	20
Average					2.5	1.15	7	29	20
					4.7	1.24	12	25	35
Without anemia	Mar. 28, 1935	Z.W.	M.	2					
	Mar. 26, 1935	C.W.	M.	4	4.6	1.18	13	28	36
Average	Apr. 17, 1935	N.B.	M.	6	5.2	1.11	15	29	43
					4.9	1.18	13	27	38
Erythroblastic	Feb. 10, 1936	P.Z.	M.	9†	2.4	1.08	6	23	21
	Dec. 13, 1935	P.Z.	M.	7†	2.6	1.23	5	19	19
Average					2.5	1.15	5	21	20
					2.9	0.94	6	21	28
Treated by sple- nectomy	Nov. 26, 1934	M.M.	F.	9					
	May 2, 1935	M.M.	F.	9	3.1	1.10	8	26	26
Average					3.0	1.02	7	23	27

\* Sicklelemlia is the term applied to the hematological anomaly in which the erythrocytes assume a sickle-like or crescentic shape *in vitro* under certain physical conditions. Sicklelemlia is manifested both without any accompanying clinical debilities and in sickle cell anemia which is characterized by distinct hematological and clinical symptoms.

† Age measured in months.

## TABLE 593

CORPUSCULAR MEASUREMENTS						RESISTANCE				Remarks
Volume	Weight	Diameter	Thickness	Diameter to thickness ratio	Volume to thickness index	HYPOTONIC NaCl		SAPONIN		
						Begin-ning	Com-plete	Begin-ning	Com-plete	
c. $\mu$	micro-grams	$\mu$	$\mu$			per cent	per cent	micro-grams	micro-grams	
86	94	7.2	2.1	3.4	1.17	0.41	0.27	10	43	
94	105	8.6	1.7	5.0	0.76	0.50	0.16	10	50	Sickling moderate, holly leaf
112	123					0.32	0.10	12	33	forms, elevated white, low
89	97	8.2	1.7	4.8	0.83	0.32	0.09	12	40	polymorphonuclear
90	94	8.1	1.8	4.8	0.86					Sickling rapid and extreme,
92	100	7.9	2.0	4.0	1.16	0.38	0.22			crises very severe, low poly-
										morphonuclear
100	109					0.30	0.08			Sickling rapid, high white, low
										polymorphonuclear
85	92					0.32	0.08	11	67	Sickling rapid, high white, low
										polymorphonuclear
75	81					0.42	0.10	9	33	Sickling extreme, high white,
										low polymorphonuclear
68	71	8.3	1.3	6.3	0.61					Sickling rapid, high white
89	97	8.2	1.7	5.0	0.84	0.37	0.10	11	45	
74	81					0.44	0.08	14	40	Sickling slow, splenectomy
										Feb. 2, 1934
88	95					0.28	0.04	11	33	Sickling rapid, splenectomy
										Dec. 8, 1926
80	87					0.36	0.06	12	37	
74	81					0.38	0.20	13	59	Sickling marked, white and
										differential normal
78	85					0.38	0.22	11	50	Sickling marked, white and
										differential normal
83	90					0.36	0.22	11	40	Sickling moderate, white and
										differential normal
78	85					0.37	0.21	11	50	
85	93	7.8	1.8	4.3	0.91					Normal white, low poly-
										morphonuclear
75	82	7.6	1.6	4.8	0.87	0.50	0.16			Normoblasts, marked budding
										of red cell
80	87	7.7	1.7	4.5	0.89	0.50	0.16			
98	107					0.34	0.06	11	50	Splenectomy July 11, 1930,
										very high white, low poly-
										morphonuclear
83	91	9.0	1.3	6.8	0.58	0.32	0.02	15	50	Normoblasts
91	99	9.0	1.3	6.8	0.58	0.33	0.04	13	50	



TABLE 593—*continued*

Observation	Date	Subject	Sex	Age	RED BLOOD CELLS		HEMO-GLOBIN		Hematocrit
					Whole blood	Per gm. cells	Whole blood	Single cells	
				yrs.	millions per c.mm.	$\times 10^{10}$	gm. per 100 cc.	micro-micro-grams	per cent
Hemolytic icterus Severe	Apr. 13, 1936	H.N.	F.	6	2.2	0.85	7	34	24
	May 22, 1936	H.N.	F.	6	3.3	1.00	9	29	30
	Dec. 20, 1934	R.F.	M.	4	2.9	0.93	6	22	28
Average					2.5	0.93	7	28	27
Mild jaundice	Jan. 21, 1935	E.T.	F.	8	4.0	1.15	13	31	32
	Dec. 13, 1934	C.T.	F.	12	4.7	1.25	11	24	34
Average					4.3	1.20	12	27	33
Anemia cured by splenectomy†	Mar. 21, 1935	D.W.	F.	12	5.6	1.26	13	22	41
	Mar. 15, 1935	E.H.	F.	8	5.9	1.23	15	25	44
	Jan. 16, 1935	P.H.	F.	12	6.6	1.28	16	24	48
Average					6.0	1.26	14	24	44
Hypochromic Before therapy	Feb. 2, 1935	G.S.	M.	7	3.6	1.16	6	15	28
	Mar. 23, 1935	L.C.	M.	2	4.0	1.48	6	14	25
Average After therapy	May 13, 1935	Ro.T.	M.	9†	4.6	1.57	7	14	27
	May 20, 1935	Ri.T.	M.	9†	5.8	1.81	8	13	29
					4.5	1.51	6	14	27
	Mar. 11, 1935	G.S.	M.	7	5.4	1.15	11	20	43
	May 27, 1935	L.C.	M.	2	5.9	1.39	11	18	39
	June 25, 1935	Ro.T.	M.	10†	6.4	1.48	14	22	40
	July 9, 1935	Ri.T.	M.	10†	7.0	1.42	12	17	45
Average					6.2	1.36	12	19	42

† Cured designates those cases whose health has returned to normal by disappearance of the anemia and accompanying clinical symptoms, although some of the hematological abnormalities of the erythrocytes persist.

TABLE 593—*continued*

CORPUSCULAR MEASUREMENTS						RESISTANCE				Remarks
Volume	Weight	Diameter	Thickness	Diameter to thickness ratio	Volume to thickness index	HYPOTONIC NaCl		SAPONIN		
						Begin- ning	Com- plete	Begin- ning	Com- plete	
c. $\mu$	micro- micro- grams	$\mu$	$\mu$			per cent	per cent	micro- grams	micro- grams	
108	117	7.0	2.8	2.5	1.60	0.66	0.28			15% reticulocytes
92	100	6.7	2.6	2.6	1.57	0.58	0.26			Splenectomy Apr. 18, 1936, anemia still severe
98	107					0.40	0.22	9	29	White normal, low polymor- phonuclear, 15% reticulo- cytes
99	108	6.9	2.7	2.6	1.59	0.55	0.25	9	29	
80	87					0.60	0.34	4	22	White and differential normal
74	80					0.65	0.31	8	33	White and differential normal
77	84					0.63	0.33	6	28	
73	79					0.50	0.30	11	40	Splenectomy July 12, 1933, white differential normal
75	81					0.46	0.26	12	67	Splenectomy June 21, 1933, white differential normal
72	78					0.50	0.26	9	67	Splenectomy Apr. 5, 1933, low polymorphonuclear
73	80					0.49	0.27	11	58	
79	86					0.47	0.22	11	33	White and differential normal
62	67					0.46	0.14	9	50	White normal, low polymor- phonuclear
59	64	7.8	1.2	6.5	0.63	0.46	0.18	11	45	Premature twins
51	55	7.7	1.1	7.0	0.56	0.40	0.18	7	29	
63	69	7.7	1.2	6.8	0.60	0.45	0.18	9	39	
80	87					0.46	0.21	9	50	Treatment, iron and ammon- ium citrate
66	72	8.1	1.3	6.2	0.63	0.40	0.16	8	40	Treatment, jeculin
62	68	7.8	1.3	6.0	0.66	0.42	0.22	10	40	Treatment, iron and small doses of copper
64	70	7.8	1.3	6.0	0.69	0.44	0.26	11	50	Treatment, liver extract plus iron
68	74	7.9	1.3	6.1	0.66	0.43	0.21	9	43	

TABLE 594

Anemia

## BLOOD LIPIDS IN HEMOLITIC AND HYPOCHROMIC ANEMIAS OF CHILDHOOD

Observation	Sub- ject*	PLASMA							ERYTHROCYTES					
		Protein	Total lipid	Phospholipid	Neutral fat	CHOLESTEROL			Total lipid	Phospholipid	Neutral fat	CHOLESTEROL		
						Total	Free	Esters				Total	Free	Esters
		per cent	mg. per 100 cc.	mg. per 100 cc.	mg. per 100 cc.	mg. per 100 cc.	mg. per 100 cc.	mg. per 100 cc.	mg. per 100 gm.	mg. per 100 gm.	mg. per 100 gm.	mg. per 100 gm.	mg. per 100 gm.	mg. per 100 gm.
Normal (Average for 16 studies)		7.1	454	136	100	143	35	182	424	244	51	116	97	32
Sicklemlia														
Anemia	C.D.	7.4	393	142	71	124	44	136	414	218	48	144	137	11
	C.D.	7.9	536	186	151	137	50	147	496	235	0	200	111	150
	C.D.	7.9	514	145	183	127	42	145	401	241	0	154	146	14
	E.D.	7.4	451	95	265	66	30	61	379	219	70	90	90	0
	A.B.	8.1	614	156	261	137	49	148	498	274	57	165	162	5
	B.D.		429	128	113	126	37	151	513	286	56	151	122	50
	J.B.	8.3	443	101	222	84	33	86	868	389	0	351	165	314
	L.L.	8.6	709	202	251	176	59	197	596	308	100	157	112	75
	R.B.	7.6	380	97	111	116	36	136	442	239	47	149	139	17
Average		7.9	496	139	181	121	42	134	512	268	42	173	132	69
Without anemia	Z.W.	6.7	467	113	144	143	45	165	456	252	19	165	136	49
	C.W.	6.8	518	140	142	160	51	185	435	235	49	130	100	50
	N.B.	7.6	660	171	222	182	59	208	484	275	72	138	138	0
Average		7.0	548	141	169	162	52	186	458	254	47	144	125	32
Erythroblastic	P.Z.		707	117	431	110	40	119	571	283	122	148	123	42
	P.Z.	6.5	440	63	228	102	35	114	518	304	68	146	146	0
	M.M.	8.2	787	164	428	139	58	137	910	555	155	200	200	0
	M.M.	7.8	768	103	527	106	58	80	1396	220	896	280		
Average		7.5	676	112	404	114	48	112	849	341	310	194	156	14
Hemolytic icterus	H.N.	6.7	477	133	159	123	32	154	287	126	50	88	56	55
	H.N.	7.0	386	111	93	120	31	151	345	180	76	89	89	0
	R.F.	7.4	627	159	221	167	51	196	413	247	15	125	82	72
	E.T.	7.6	363	81	113	112	30	139	408	200	0	159	89	119
	C.T.	7.4	486	154	162	112	37	127	392	205	62	116	102	24
Average		7.2	468	128	150	127	36	154	369	192	41	115	84	52
Cured by splenectomy	D.W.		509	151	75	186	46	237	450	259	0	161	117	74
	E.H.		531	102	137	192	45	247	484	264	46	150	115	59
	P.H.		451	109	172	116	38	132	307	172	29	106	106	0
Average			497	121	128	165	43	206	414	232	25	139	113	44
Hypochromic														
Before therapy	G.S.	8.3	641	151	251	160	47	192	509	300	70	135	129	10
	L.C.	6.9	369	86	94	129	45	142	592	341	57	178	155	39
	Ro.T.	6.7	647	160	207	186	49	231	556	305	27	191	145	79
	Ri.T.	7.0	786	210	309	179	52	215	505	261	0	210	161	83
Average		7.2	611	152	215	164	48	196	541	302	39	179	148	52
After therapy	G.S.	7.3	430	101	121	143	48	160	454	304	22	128	128	0
	L.C.	7.7	303	91	49	115	45	119	543	339	0	190	170	34
	Ro.T.	6.5	561	158	124	195	75	204	624	258	138	200	159	41
	Ri.T.	7.8	752	182	239	219	58	273	500	285	21	178	154	41
Average		7.3	512	133	133	168	57	188	530	297	45	174	153	35

\* The sequence of date, age, and sex is the same as in Table 593.

TABLE 594

Anemia

BLOOD LIPIDS IN HEMOLITIC AND HYPOCHROMIC  
ANEMIAS OF CHILDHOOD

CORPUSCLE†						Remarks
Total lipid	Phospholipid	Neutral fat	CHOLESTEROL			
			Total	Free	Esters	
×10 <sup>-12</sup> mg. per cell	×10 <sup>-12</sup> mg. per cell	×10 <sup>-12</sup> mg. per cell	×10 <sup>-12</sup> mg. per cell	×10 <sup>-12</sup> mg. per cell	×10 <sup>-12</sup> mg. per cell	
399	233	44	110	92	30	
434	229	50	151	144	12	Severe crisis
608	288	0	245	136	184	Very severe
390	234	0	150	142	14	Severe
378	218	69	89	89	0	Severe crisis
543	299	62	180	176	6	Severe
474	263	52	139	112	27	Severe
706	316	0	285	134	255	Moderate
479	248	80	126	90	60	Severe, splenectomy Feb. 2, 1934
422	228	45	142	133	16	Severe, splenectomy Dec. 8, 1926
493	258	40	167	128	66	
369	204	15	133	110	40	
367	199	41	110	85	42	
435	247	65	124	124	0	
390	217	40	122	106	27	
466	231	100	121	101	34	Severe crisis
481	282	63	135	135	0	Severe crisis
970	592	165	213	213	0	Very severe, splenectomy July 11, 1930
1264	199	812	254			Severe
795	326	285	181	150	11	
336	148	59	103	66	65	Hemolytic crisis
346	180	76	89	89	0	Severe, splenectomy Apr. 18, 1936
443	261	16	134	88	77	Severe
356	174	0	139	77	104	Mild jaundice
314	164	59	93	82	19	Mild jaundice
359	185	42	112	80	54	
356	205	0	127	93	59	No anemia, splenectomy July 12, 1933
394	215	37	122	94	48	No anemia, splenectomy June 21, 1933
240	135	23	83	83	0	No anemia, splenectomy Apr. 5, 1933
330	185	20	111	90	34	
438	258	60	116	111	9	Severe
399	230	38	120	104	26	Very severe
355	195	17	122	92	50	Severe
279	144	0	116	89	46	Severe
368	207	29	119	99	34	
393	263	19	110	110	0	Mild
390	244	0	136	122	24	Mild
424	175	94	136	108	47	Normal
351	200	15	125	108	29	Normal
390	221	32	127	112	25	

† Represents the concentration in an average single red blood cell.

The data on the lipid composition of blood platelets were included in a published paper and are reprinted by courtesy of *The Journal of Clinical Investigation*.\*

TABLE 595

Normal Blood  
Hemophilia  
Thrombopenic Purpura

## COMPOSITION OF BLOOD PLATELETS OF CHILDREN

*Values in per cent of dry weight*

	Throm- bopenic purpura*	Hemophilia†			Normal children‡
Number of subjects	1	5	4	3	9
Total lipid	12	12	15	15	13
Phospholipid	9	7	10	9	9
Free cholesterol	2	2	3	3	3
Cholesterol esters	0.1	1	1	0	0
Neutral fat	1	2	1	3	1
Cephalin§	66	69	63	66	—
Protein	74	72	76	69	56

\* Twelve-year-old girl.

† Nine individual platelet samples (combined as two samples for analysis) collected from the blood of five hemophiliacs with prolonged clotting times (2 to 5 hours). Three samples (pooled as one) secured from three hemophiliacs with only slightly lengthened clotting times (15 to 30 minutes), but who had marked hemorrhagic symptoms and prolonged bleeding times. The diagnosis of hemophilia in these individuals (ages 5 to 13 years) was established beyond question by clinical and laboratory observations over a period of several years.

‡ Sodium citrate used as anticoagulant for all samples. The subjects were 9 children (ages 4 to 8 years) who were participating in the study of nutrition and chemical growth in childhood.

§ Per cent of total phospholipid.

\* Erickson, Betty N., Harold H. Williams, Ira Avrin and Pearl Lee. The lipid distribution of human platelets in health and disease. *J. Clin. Investigation*, 18: 81, 1939.



## EPILEPSY

At the time the blood studies of D.D. were made he was thought to represent true idiopathic epilepsy. After the work was completed, hospital records under his grandmother's name were found which showed that he had had a skull fracture at the age of 8 years and had not had seizures typical of idiopathic epilepsy. The data are published here because they do demonstrate an abnormal blood picture in connection with neurological involvement.

The patient was a full-term infant, delivered with instruments, and had to be slapped to initiate breathing. He has had strabismus since early childhood. In his early years the boy had the usual childhood illnesses and during his eighth year fell and fractured his skull. In the time he was in the hospital he gained 6 pounds and continued to gain rapidly until he was obese. At fourteen years he weighed 148 pounds. During his fourteenth year he was troubled with violent headaches and one day, when he was feeling very tired, he "fainted." His seizure consisted of standing perfectly still and very rigid for one minute. After recovery he was extremely tired and his mind hazy. Thereafter he had similar attacks two or three days per week, often two or three attacks on each day.

When the patient was examined at Henry Ford Hospital, Detroit, psychometric tests indicated an I.Q. of 109. A high glucose tolerance was discovered and various forms of diet therapy were tried with little success, perhaps principally for lack of cooperation by the patient. In the following years D.D. was seen both at Henry Ford and at University Hospital, Ann Arbor. Encephalograms were made and the possibility of a slight hydrocephalus was seen. He was completely skin-tested. An electrocardiogram indicated slight enlargement of the ventricles.

At the time this patient was the subject of the blood studies (age, 20 years) the attacks seemed of shorter duration and he ascribed the shorter aftermath of the attacks to the injections he had been receiving from Dr. Oliver P. Kimball, M.D., through whose interest the Laboratory had the opportunity of making the studies.

TABLE 596

Epilepsy (D.D.)

LIPID AND MINERAL COMPOSITION OF  
PLASMA AND ERYTHROCYTES

Octo- ber	PLASMA LIPID (mg. per 100 ml.)					Fatty acid iodine number	MINERALS (mg. per 100 ml.)		
	Total	Phos- pho- lipid	CHOLESTEROL		Neu- tral fat		SERUM		
			Esters	Free			Sodium	Potas- sium	Chlo- rine
21	275	63	126	23	62	88	331	15	350
22	385	106	122	35	123	104	—	—	—
23	351	44	141	18	148	101	—	—	—
24	458	118	85	37	218	118	—	—	—
25	381	105	180	26	69	103	—	16	362
26	280	124	124	32	0	122	—	—	—
27*	437	137	137	32	131	107	330	16	351
28	223	63	108	13	40	81	325	17	356
29	428	80	149	36	163	95	—	—	—
30†	373	88	152	25	108	90	330	14	363
ERYTHROCYTE LIPID (mg. per 100 gm.)							ERYTHROCYTES		
21	301	198	49	54	0	91	37	395	173
22	407	251	80	76	0	82	—	—	—
23	430	247	73	70	41	86	—	—	—
24	460	310	62	88	0	98	—	—	—
25	434	279	43	74	38	108	—	393	208
26	379	234	47	92	5	87	—	—	—
27*	424	269	61	94	0	69	21	421	177
28	411	232	45	100	34	47	38	—	197
29	423	251	49	82	41	78	—	—	—
30†	543	358	27	118	41	94	34	436	157

† Seizure 4 hours before sample.

\* Seizure 1 hour after sample.

TABLE 597

## WEIGHT OF ALCOHOL-DRIED FOOD AND OVEN-DRIED FECES\*

*Values are grams per day*

FOOD								
<i>Date</i>	<i>Frank</i>	<i>Herbert</i>	<i>Jimmy</i>	<i>Barbara</i>	<i>Donald</i>	<i>Billy</i>	<i>Bobby</i>	<i>Lipemia (R.B.)</i>
9-18	444	443	408	400	449	444	407	400
9-23	454	458	411	412	456	459	411	409
9-28	477	484	440	432	484	476	434	429
10-3	476	476	433	435	476	477	433	429
10-8	451	462	412	409	459	455	416	405
10-13	478	475	438	426	476	477	437	425
10-18	475	474	427	424	474	473	439	423
10-23	481	487	438	438	483	488	451	437
10-28	479	478	440	432	479	480	438	432
11-2	476	478	441	429	478	479	440	428
11-7	476	485	440	433	480	486	441	431
FECES								
9-18	21.2	20.8	18.2	21.6	18.4	20.8	22.2	22.2
9-23	13.2	20.4	18.0	23.0	19.8	21.8	22.4	23.4
9-28	21.2	19.4	19.2	16.8	21.8	20.2	22.4	23.0
10-3	16.0	18.4	15.6	17.2	18.8	22.2	18.4	20.6
10-8	21.6	18.6	18.0	20.2	20.0	20.2	22.2	23.6
10-13	14.6	14.8	15.0	16.0	20.4	18.0	20.2	18.0
10-18	18.8	17.8	17.4	18.0	18.0	20.8	20.0	21.4
10-23	18.4	16.8	19.4	18.4	22.4	22.0	23.2	25.4
10-28	21.6	21.2	19.0	18.6	18.4	24.6	22.2	23.2
11-2	20.0	19.0	18.6	20.2	21.4	22.8	22.6	22.4
11-7	20.0	16.8	16.2	15.4	18.6	20.4	26.0	23.0

\* See pages 234-239 for details of preparation of analytical material.



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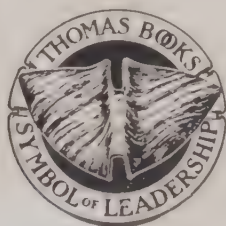
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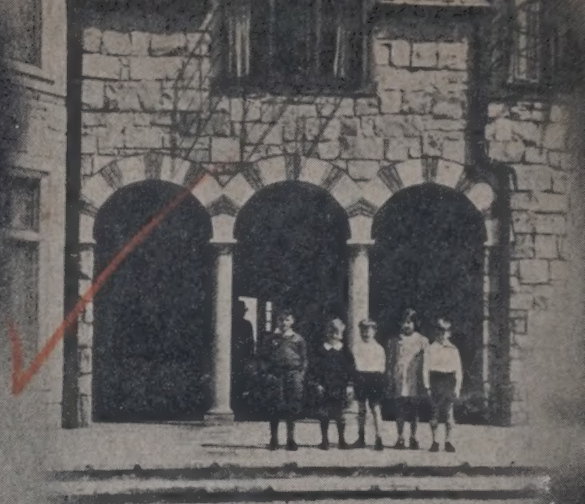
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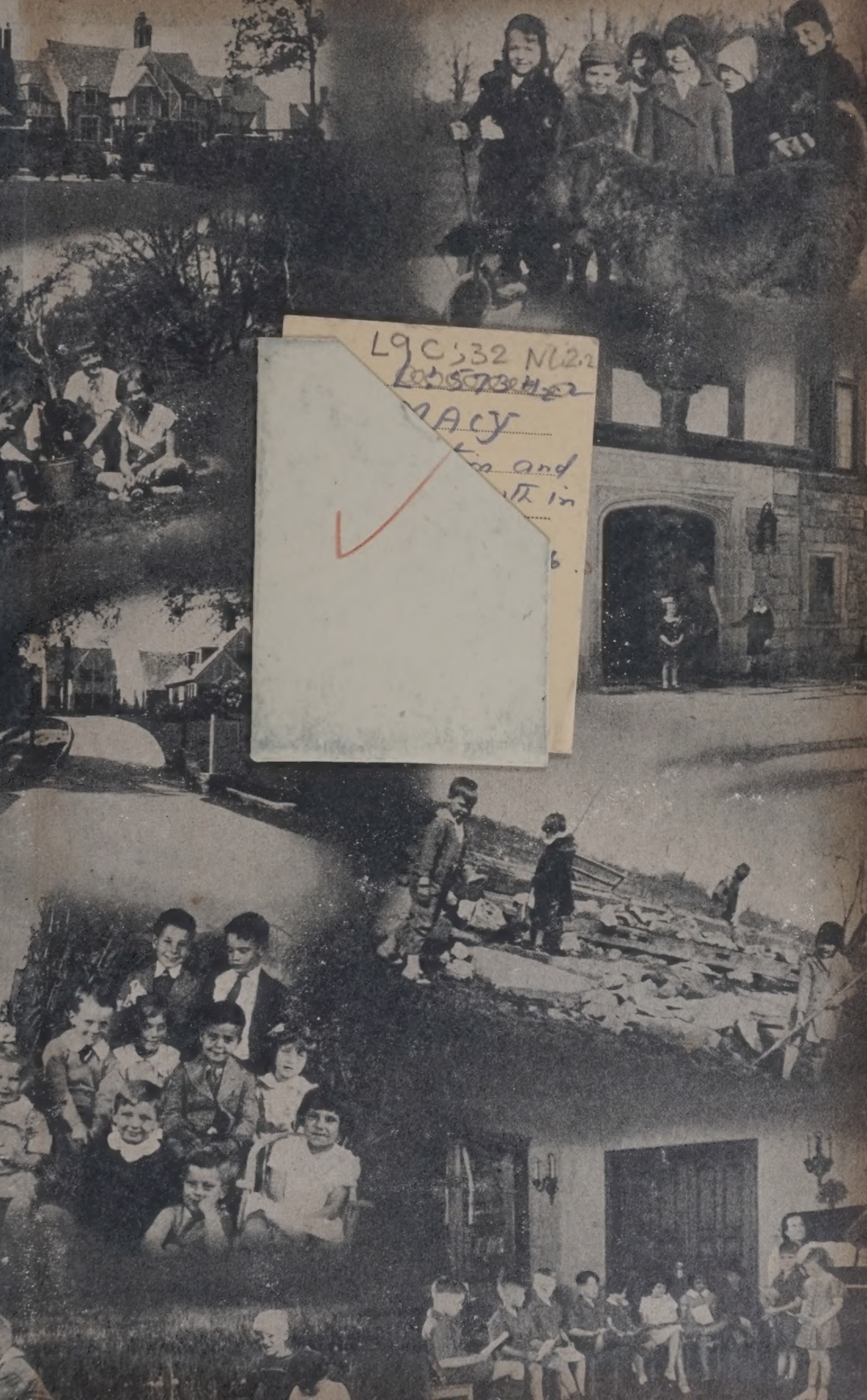
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